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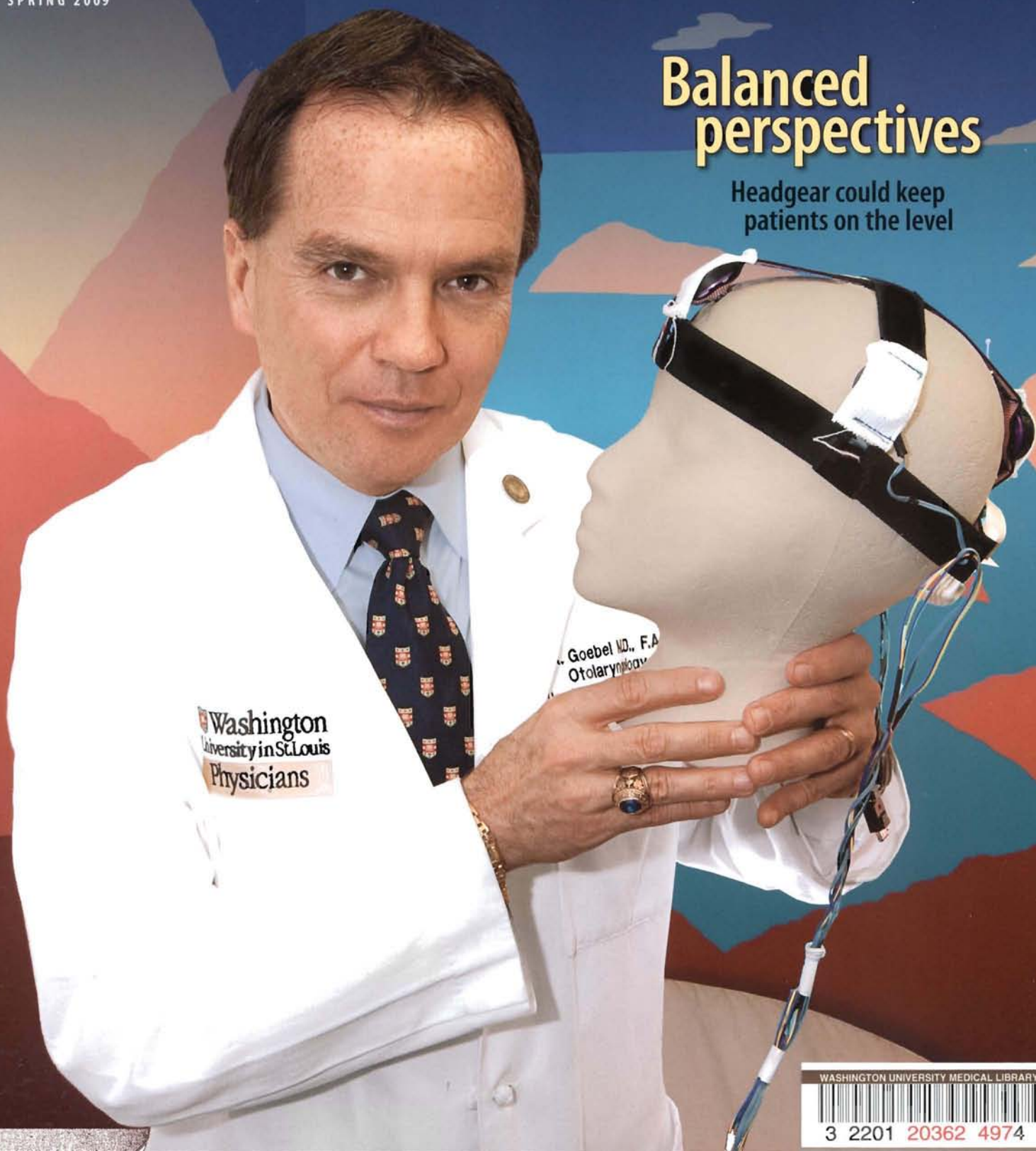
Outlook

 Washington
University in St. Louis
SCHOOL OF MEDICINE

SPRING 2009

Balanced perspectives

Headgear could keep patients on the level



Washington
University in St. Louis
Physicians

Goebel MD., F.A.
Otolaryngology

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ROBERT BOSTON

Extreme number crunching

Genome analysis requires massive computing support. Now, a specially constructed, fortress-like building houses computing resources just a quick walk across the street from The Genome Center. Designed to become the first LEED Gold-certified building on the School of Medicine campus, this utilitarian structure won a 2008 St. Louis Keystone Award for construction excellence. Inside, dozens of racks of computers with more than 2 petabytes (2,000,000 gigabytes) of disk storage run 24/7, processing data like that needed to decode the DNA of a single cancer patient (see story, page 12). Computations that took seven years during the original Human Genome Project can now be completed in about seven days in the new facility, which offers ample capacity for future expansion.

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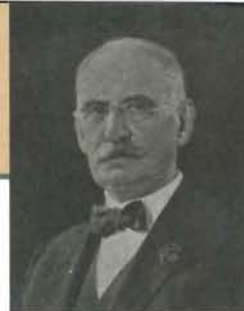
A continuing need for scholarship support

Turn this card for the inspiring story
of a generous legacy that still helps
students at the School of Medicine.



*Support for today's students
means a future of beneficial care
and scientific breakthroughs.*

See page 36



Jackson Johnson

His generosity lives on

"Under the will of the late Jackson Johnson, the sum of \$250,000 was donated to the School of Medicine, the income of which is to be used to aid worthy and desirable students in acquiring and completing their medical education."

With this brief item in the 1930 Washington University School of Medicine *Bulletin*, so began the endowed Jackson Johnson Scholarship Fund.

Jackson Johnson was president of International Shoe Company, the largest shoe manufacturer in the country early in the 20th century. He was elected to the Washington University Board of Trustees in 1919 and served until his death in 1929. He endowed the Jackson Johnson Scholarship Fund in memory of his son, Jackson Johnson Jr., who lost his life in "the Service of the United States during the Great War."

Coming during the Great Depression, these resources were critical in making it possible for aspiring young students to pursue their medical educations. And for over 70 years, this scholarship fund has continued to do just that. Since its inception, more than 700 young men and women have received about \$1 million in financial assistance.

To maintain its reputation for excellence, Washington University School of Medicine must continue to attract the most promising and best qualified students. Many of these exceptional students will require financial assistance, and the need for scholarship support is growing faster than available resources can sustain.

**To learn more about how you can
make an impact, please contact the
Office of Medical Alumni and Development
at (314) 935-9691.**

 **Washington**
University in St. Louis
SCHOOL OF MEDICINE

Outlook

Washington University School of Medicine
VOLUME XLVI • NUMBER 1 • SPRING 2009



12 Cancer gene research team

COVER Joel A. Goebel, MD, FACS, professor and vice chairman of the Department of Otolaryngology and director of the School of Medicine's Dizziness and Balance Center, stands inside the platform test booth with its colorful, artificial landscape. He holds "Gertrude," a styrofoam head that models the device Goebel's patients wear during balance research. For more on this story, please turn to page 16.

PHOTO BY ROBERT BOSTON



8 International investigation

Drama in the Dialysis Unit

8 Medical center teams avert disaster with quick thinking and careful analysis, leading to an international investigation.

Dangerous Transformations

12 The study of one individual's genetic mutations is helping researchers expand their approach in the diagnosis and treatment of cancer.

What's Up? Retraining the Brain

16 A wearable device may help people with balance problems maintain their equilibrium when their vestibular systems go awry.

When Flexner Saw the Future

21 The infamous report on the nation's medical schools led to a complete reorganization of the School of Medicine and to the establishment of the present medical center.

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26 A love of art

Researchers have found a way to take advantage of the malaria parasite's natural tendency to re-engineer its own genetic material. The parasite (pictured in green inside a red blood cell, with iron stolen from the blood cell visible) has already helped them identify an attractive target for drug development.

Deadly secrets

MPH GRAPHIC • SCIENCE IMAGE: DANIEL GOLDBERG

Malaria parasite's genetic tinkering may lead to drug development

Researchers seeking ways to defeat malaria have found a way to get help from the parasite that causes the disease.

Scientists at the School of Medicine let *Plasmodium falciparum*, one of the deadliest strains of malaria, do a significant portion of the genetic engineering work in a recent study, published in the Feb. 3, 2009 edition of *Proceedings of the National Academy of Science*. With that help, they could unambiguously show that the parasite relies heavily on a one-of-a-kind protein that it makes only in small quantities, two qualities that make the protein an attractive drug development target.

The protein in question, called Pcalp, is the parasite's only calpain, a specialized form of protease. Humans, in contrast, have more than a dozen calpains. The parasite makes very little Pcalp.

"When we first talked about Pcalp, the low levels we reported had people skeptical that it could do much at all during human infection," says Daniel E. Goldberg, MD, PhD, professor of medicine and of molecular microbiology and Howard Hughes Medical Institute Investigator in Medicine. "They suggested that Pcalp had to be more important to malaria during other stages in its life cycle, such as the one that takes place in mosquitoes."

The malaria parasite relies heavily on a one-of-a-kind protein that it makes only in small quantities.



Normally microbiologists test a protein's importance by removing the gene for it and checking if the organism survives. However, a few recent reports suggested that the way scientists were removing genetic material from the malaria parasite could adversely impact its chances for survival, producing false positives — genes that seemed to be essential but were not.

To solve this problem, Ilaria Russo, PhD, lead author of the study, took advantage of microorganisms' natural ability to genetically re-engineer themselves using mobile bits of DNA called plasmids. She created multiple copies of two plasmids: one with a slightly altered but still functional version of Pcalp, and another with a copy of Pcalp mutated so that it could not work correctly.

The parasite could incorporate the first version of Pcalp, but the researchers found evidence that it avoided stitching the second, defective version into its DNA. This showed that Pcalp is essential to the malaria parasite, according to Goldberg.

Researchers receive \$11 million to study diabetic heart disease

Studies will focus on several angles

Researchers at the School of Medicine, led by heart specialist Richard W. Gross, MD, PhD, are studying how altered fat metabolism causes heart failure in diabetic patients. They have received a five-year, \$11 million grant from the National Institutes of Health to continue their investigations.

In people with diabetes, lack of insulin or insulin resistance makes it impossible for heart cells to take in enough blood sugar (glucose), which causes heart cells to ingest and digest much more fat to fuel their huge energy demands. But that survival strategy eventually undermines the health of the heart and contributes to heart disease.

"Two-thirds of people with diabetes die of cardiovascular disease," says Gross, professor of medicine, of chemistry and of developmental biology. "It used to be unpopular to assert that fats caused heart cell dysfunction in diabetes; it was thought that diabetic heart problems were caused by arterial plaques that diminished blood flow to the heart. But now we know that many people with diabetes develop heart failure even without having coronary artery disease. And increas-



Richard W. Gross, MD, PhD, and Xianlin Han, PhD, MS, analyze fats from biological samples using shotgun lipidomics.

ingly, research is showing the detrimental role of fats in diabetic heart disease."

Gross' research requires analysis of the fats in the chambers and membranes that make up heart cells. For that, he and his research team developed sophisticated ways of telling apart the myriad forms that fat molecules possess and

for measuring extremely small amounts of fat molecules.

Gross and his colleagues, including Xianlin Han, PhD, MS, associate professor of medicine, created shotgun lipidomics, a technology that sorts fat molecules and allows researchers to identify and quantify them.

Co-investigator Nada A. Abumrad, PhD, the Dr. Robert C. Atkins Professor of Medicine and Obesity Research, earlier discovered a fat transporter, which pulls individual molecules of fat into cells. She and her colleagues will research its role in diabetic cardiovascular disease.

Anthony J. Muslin, MD, the Oliver M. Langenberg Distinguished Professor of the Science and Practice of Medicine, and his colleagues will address how heart cells are affected by the decrease in insulin that occurs with diabetes.



ROBERT HUSTON

Faculty honors David B. Gray, PhD, associate professor of occupational therapy and of neurology, was honored with a Distinguished Community Service Award at the 2009 Distinguished Faculty Awards ceremony held in January. M. Carolyn Baum, PhD, professor of occupational therapy and of neurology and the Elias Michael Director of the Program in Occupational Therapy, received a Distinguished Educator Award for graduate student teaching. Eighteen School of Medicine faculty were honored at the event, which recognizes outstanding achievements in clinical care, community service, research and teaching. To view a complete list of awardees, please visit mednews.wustl.edu/DFA.

New grants for pediatric research

The Children's Discovery Institute (CDI), a collaboration between St. Louis Children's Hospital and Washington University School of Medicine, has awarded 15 new research grants, bringing the total investment in finding cures and treatments for devastating childhood diseases to more than \$11.5 million since 2006. The new awards total just over \$4 million and were given to 15 researchers in seven departments at the School of Medicine and in the university's College of Arts & Sciences.

"Forward-thinking individual contributors interested in speeding the pace of discoveries in pediatric medicine made this possible," says Alan L. Schwartz, PhD, MD, Children's Discovery Institute executive director and the Harriet B. Spoehrer Professor and chair of the Department of Pediatrics. "Our institute investors understand the risks and potential rewards of supporting high-risk research by young investigators. They have refused to allow progress to lapse even in these troubled financial times."

Funded researchers

- Ana Maria Arbelaez, MD
- Jeff Bednarski, MD, PhD
- Yehuda Ben-Shahar, PhD
- Roberta Faccio, PhD
- Sanjay Jain, PhD, MD
- Nguyet Nguyen, MD
- Audrey Odom, MD, PhD
- Rob Mitra, PhD
- Stephen Rogers, PhD
- Joshua Rubin, MD, PhD
- Scott Saunders, MD, PhD
- David Wang, PhD
- Barbara Warner, MD
- Monita Wilson, PhD
- Dong Yu, PhD



Artistic expressions Leslie Neems, a first-year medical student, looks at a black-and-white photograph, "Ophelia's Garden," by Lori A. Nichols, administrative professional in the Department of Neurology, at the annual Student, Faculty and Staff Art Show in the Farrell Learning and Teaching Center Atrium. Held earlier this year, the show featured 112 pieces, including original photography, painting, mixed media, charcoal, ceramics and other forms of art, by 62 members of the School of Medicine community.

Inder honored for clinical research

Terrie E. Inder, MD, PhD, has received a 2008 Distinguished Clinical Scientist Award from the Doris Duke Charitable Foundation. The \$1.5 million award recognizes outstanding leadership in clinical research and allows leading physician-scientists to meld biomedical research and clinical applications that improve human health.



Terrie E. Inder, MD, PhD

Inder, a pediatrician and researcher at the School of Medicine and St. Louis Children's Hospital, was one of six award recipients.

"Terrie Inder is an outstanding clinical investigator who bridges the gaps between basic neurobiology, translational medicine and health outcomes for our smallest and most vulnerable patients," says Alan L. Schwartz, PhD, MD, the Harriet B. Spoehrer Professor and head of pediatrics.

Inder, who also is an associate professor of pediatrics, of neurology and of radiology, uses brain imaging studies of premature, at-risk infants to help predict developmental outcomes, in particular the risk of severe cognitive delays, psychomotor delays, cerebral palsy or hearing or visual impairments. She also co-directs a large multidisciplinary team (pediatrics, neurology, radiology, obstetrics and psychology) that provides clinical care, teaching and research to improve the outcomes for infants born at risk for disability.

Women's health research is focus of St. Louis conference

New initiatives focus on areas of need

Washington University recently hosted a national meeting on behalf of the NIH Office of Research in Women's Health to discuss the development of its research priorities for the next decade. The event, held March 4–6, was part of the NIH's "Moving Into the Future: New Dimensions and Strategies for Women's Health Research" series. This was the first of four regional conferences to be held this year that will explore new avenues for research into diseases and issues that affect women. It began with a public hearing to gather input from scientists, health care providers, patients, community groups, advocacy groups and other interested parties.

"This was a wonderful opportunity for researchers, clinicians and the public to make a significant impact on the direction and future of federally funded women's health research," says Samuel L. Stanley Jr., MD, vice chancellor for research.

The meeting included panel discussions and presentations on translating unmet medical needs into new research initiatives. It also brought together more than 300 U.S. physicians, scientists and public policy officials, who worked to develop specific recommendations and priorities in seven areas: chronic pain, bladder and pelvic floor disorders, brain and psychiatric disorders, infectious diseases of the urinary and reproductive tracts, obesity and eating disorders, genetics and microbial communities, and women in biomedical careers.

"We think the conference really energized the scientific community around the issues of women's health," says Scott J. Hultgren, PhD, director of the Center for Women's Infectious Disease Research and the Helen L. Stoeber Professor of Molecular Microbiology. "We believe the innovative ideas generated at the meeting will stimulate cutting-edge research on women's health and disease for years to come."



Raksha Jain, MD, a clinical fellow in pulmonary and critical care at the School of Medicine and Barnes-Jewish Hospital, speaks at the women's health conference.



BETH CLARK

Helping hands

Left: Angela Buehner, center, third-year doctoral student in the Program in Physical Therapy, and Cheryl Caldwell, assistant professor of physical therapy, splint a patient's wrist to alleviate pain while working in a clinic in Teupasente, Honduras. Above: WUSTL pre-med undergraduate Tiffany Hseih, left, and a Honduran Global Medical Brigade staff member build a water pila (storage tank). Buehner, Caldwell and Hseih were among a group of 40 Washington University students and faculty visiting Honduras in January as part of the university's first trip with Global Medical Brigades, an international organization that provides communities in developing nations with sustainable solutions to improve health. The trip was organized by WUSTL undergraduate pre-medicine students.



KRISTY YOUNG

PEDIATRIC RADIOLOGY

At risk for autism? Let's look

Autism researchers at the School of Medicine are joining other scientists to image the brains of infants and attempt to identify anatomical and behavioral changes that may be linked to the onset of autism.

The \$10 million, NIH-funded Infant Brain Imaging Study allows investigators to analyze early brain development in children at elevated risk for autism spectrum disorders by virtue of having an autistic sibling.

"We don't know much about brain development in children with autism or at risk for autism, but we do know that symptoms start very early," says Kelly N. Botteron, MD, principal investigator at the Washington University study site and a child psychiatrist at St. Louis Children's Hospital. "We think it's going to be very important to learn about the changes in early brain development that may be associated with autism."

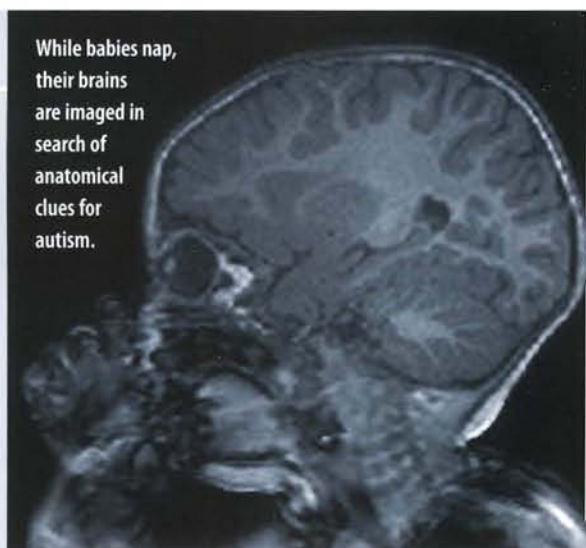
Botteron's team is joining researchers from the University of North Carolina, the University of Washington in Seattle and

Children's Hospital of Philadelphia to collect MRI brain images from children as young as 6 months old. The project also includes a data-coordinating center at the Montreal Neurological Institute in Canada.

"We're recruiting infants as young as possible — even during the mother's pregnancy — for interviews and screenings, and then they come to see us for brief testing and to have MRI scans at 6 months," says Botteron, who is an associate professor of child psychiatry and radiology at the School of Medicine. "They come back for more scans and more testing at 12 months and again at 24 months."

The Washington University portion of the Infant Brain Imaging Study uses MRI imaging to get a detailed look at the brain's anatomy. The investigators also perform what's called resting-state, functional MRI imaging, which provides information about how the various structures in the brain connect to one another while the baby is resting. A third imaging technique, called

While babies nap, their brains are imaged in search of anatomical clues for autism.



diffusion tensor imaging, allows Botteron's team to analyze characteristics of the brain's gray matter and white matter.

Botteron plans to collect brain images from 110 infants with an autistic sibling. She also will scan the brains of 60 control infants who don't have a sibling with autism. The five-year study will allow researchers to follow the infants over time to identify which infants develop autism and whether the brain scans can help predict that risk.

For more information or to volunteer for the nationwide study, visit ibis-network.org. At WUSTL, e-mail flakel@psychiatry.wustl.edu.



Rock 'n' roll docs Members of The McDreamies, a band made up of students in the School of Medicine, perform during the recent graduate school "Battle of the Bands" held at The Gramophone in St. Louis. Students from the School of Law had two bands in the competition, De Facto and The Restatement, and a group from the Olin Business School, Phat Cat McGhee and the Warren Buffets, also performed at the inaugural event. The competition was close, but The McDreamies were named the winning band after a well-timed stage dive by one of its members.

Mutch assumes new leadership role

David G. Mutch, MD, director of the Division of Gynecologic Oncology and the Ira and Judith Gall Professor of Obstetrics and Gynecology, has been elected the 41st president of the Society of Gynecologic Oncologists, a national medical specialty organization of physicians trained in the comprehensive management of women with malignancies of the reproductive tract.

"I am dedicated to working with our leadership to energize the profession and keep us as a professional society focused on our vision to eradicate women's cancers," says Mutch. "We are in the midst of an exciting time in health care, where the advances made in the scientific arena are changing the treatment landscape daily. It is amazing to be able to positively impact the lives of those women for whom we care."

Mutch, who also serves as vice chair for gynecology, is the recipient of multiple research grants from the American Cancer Society and the National Institutes of Health, among others. He is the principal investigator for the Gynecologic Oncology Group at Washington University and has authored or co-authored more than 180 peer-reviewed publications as well as numerous book chapters on the treatment of cancers of the female reproductive tract. Currently, Mutch is the co-principal investigator on an NIH grant looking at defective DNA mismatch repair in endometrial cancers.



David G. Mutch, MD

Outstanding faculty honored

The 2008 Samuel R. Goldstein Leadership Awards in Medical Student Education have been awarded to Leslie E. Kahl, MD, David J. Murray, MD, and Linda J. Pike, PhD.

The annual awards recognize outstanding teaching and commitment to medical education and are among the highest honors that faculty can achieve.

Kahl is a professor of medicine and associate dean for student affairs. She teaches in all four years of the medical school curriculum, including oath-building in the first year, coursemaster of the second-year rheumatology course, third-year lectures in the internal medicine clerkship, and hosting fourth-year students in her rheumatology clinic.

Murray is the Carol B. and Jerome T. Loeb Professor of Medicine, professor of anesthesiology and director of the Clinical Simulation Program, which he has headed since 1996. Simulation-based training programs designed by Murray provide experiential learning opportunities for medical students, interns and residents and allow them to acquire many skills directly applicable to patient care.

Pike is associate professor of biochemistry and molecular biophysics. She is coursemaster for the first-year Molecular Foundations of Medicine course, which she reorganized by increasing the clinical relevance, reducing the number of lecturers, changing the nature of exams and introducing electronic presentations. Pike is also a lecturer for the Cell and Organ Systems Biology course.



Patrick J. Geraghty, MD

Volunteer surgeon treats U.S. soldiers

Two weeks away from home is nothing compared to the long tours of duty our soldiers face, says Patrick J. Geraghty, MD, associate professor of surgery. The vascular surgeon lent his expertise to military physicians during a recent stint at Landstuhl Regional Medical Center at Ramstein Air Force Base in Germany.



Wounded soldiers leaving
Ramstein Air Force Base



Future scientists

Seventh-grader John Ordonez observes Hongwei Du, post-doctoral research associate in ophthalmology and visual sciences, as he creates nano-materials using chemical reactions. Twenty St. Louis middle school students visited the medical school on February 17 for the second annual Junior Science Institute. The event, sponsored by the Association of Black Biomedical Graduate Students, is designed to increase science appreciation.

GENETICS

Modeling gene expression

Scientists have long struggled to decipher the genetic instruction book that details where and when the 20,000 genes in a human cell will be turned on or off. Different genes operate in each cell type at different times; this careful orchestration is what ultimately distinguishes a brain cell from a liver or skin cell.

Now, researchers at the School of Medicine report in the Jan. 8, 2009 issue of *Nature* that they have developed a model of gene expression in yeast that predicts with a high degree of accuracy whether a gene will be switched on or off.

"A huge part of the magic in biology happens at the level of a cell deciding whether it is going to transcribe a gene or not," says senior author Barak A. Cohen, PhD, assistant professor of genetics. "We have found that just a few simple rules may underlie the complicated gene expression patterns that determine whether a particular gene will be expressed at high levels in one tissue and low levels in another tissue."

Researchers have known for some time that the instructions for controlling gene expression lie in short DNA sequences, called promoters, embedded in long, rambling stretches of DNA at the front of most genes. Proteins known as transcription factors bind to promoters to either activate a particular gene or shut down its activity.

But in reality, the regulation of a gene is far more complex. The model Cohen and his colleagues developed takes into account how tightly transcription factor proteins bind to DNA in the promoter region and to each other. This can explain most of the variation in gene expression between different promoters.

"Our model answers the question: How do cells read the instructions for gene expression," Cohen says. "They are read mostly by the simple binding of transcription factors to DNA. This binding either recruits the enzyme RNA polymerase, which begins the process of copying and transferring information stored in the genes, or blocks it."



While Cohen is still perfecting the model, he says it may eventually enable scientists to determine where and when all the genes in the human genome will be expressed just by looking at the genetic code in the promoter region.

The model also may help researchers engineer artificial promoters that drive embryonic stem cells toward a particular fate or that will turn on a gene in only a particular cell type. If scientists know the code that turns on a particular gene, they could conceivably design an artificial promoter as a potential treatment for disease.

drama in the dialysis unit

**Dialysis patients
fell dangerously ill.**

**Fast thinking —
and fast action —
saved lives and
spurred an
international
investigation.**

BY BETH MILLER

**ST. LOUIS CHILDREN'S HOSPITAL
JANUARY 4, 2008**

Two pediatric patients undergoing kidney dialysis experience sudden, life-threatening allergic reactions. Their eyes, lips and tongues begin to swell, raising their heart rates and dropping their blood pressures dangerously low.

After dialysis staff treat the children with medication to relieve their symptoms, nephrology unit medical director Anne M. Beck, MD, associate professor of pediatrics, and her staff contact pediatric infectious disease specialist Alexis M. Elward, MD, assistant professor of pediatrics, who quickly begins looking for the cause.

"I was most suspicious it was a chemical reaction because it seemed to hit as soon as the patient's blood hit the dialyzer tubing," Elward says.

But records indicate two similar incidents at the hospital in November of 2007.

**SITUATION TEAMS ACTIVATED
JANUARY 4, 2008**

Elward, along with Marilyn L. Jones, RN, MPH, director of Interventional Epidemiology Programs for Patient Safety and Infection Prevention for BJC HealthCare, activate BJC HealthCare's Epidemiology and Patient Safety Consortium, with a "SWAT team." The group includes an epidemiologist, data analyst, database manager and other health care professionals.

"The 'SWAT team' is one thing that makes BJC positively unique," says Jones. "We have the ability to assist our BJC hospital teams whenever the safety of patients is of concern. The team is rapidly deployed to figure out control measures and find answers."

St. Louis Children's Hospital also activated its team, which includes physicians, nurses, risk management, materials management and information systems.

**24/7 COMMAND CENTER
JANUARY 7, 2008**

With Elward and Jones at the helm, the teams set up a command center from which they work around the clock during the next week. They research the lot numbers of medications, the kind of tubing used and the water sources into the dialysis machines, and they review policies and procedures.

In a literature search of similar incidents at other dialysis centers, Elward finds that the anti-clotting drug heparin was a possible cause of allergic reactions. But the symptoms were different from those experienced by the patients at St. Louis Children's Hospital. She and the team post warnings about the reactions on several pediatric and dialysis listservs, report the event to the Food and Drug Administration (FDA) and contact the Centers for Disease Control (CDC) and the Missouri Department of Health and Senior Services.



FDA REPS AT MEDICAL CENTER
JANUARY 7, 2008

Food and Drug Administration representatives arrive on site in St. Louis to take heparin samples.

Elward contacts Baxter International, which manufactured the heparin used at St. Louis Children's Hospital, to inform them of the problem.

Dialysis must continue and so the clinic staff leave nothing to chance. They change all equipment, water sources and medications — including using heparin from a different manufacturer — and relocate the clinic within the hospital.

"We were thinking that we really needed to get an answer as quickly as possible, because dialysis is not something that can be postponed for very long," says Elward. "We took every possible step to protect our patients."

But still, there was no clear understanding of the root of the problem.

CENTERS FOR DISEASE CONTROL
JANUARY 14, 2008

At the request of the Missouri Department of Health and Human Services, a CDC officer arrives at the command center to assist in the ongoing investigation at St. Louis Children's Hospital. In the nearly two weeks since the CDC first posted warnings on a national listserv of dialysis units, dozens of phone calls and e-mails from other centers nationwide reported patients with similar reactions.

"It was great to have the input of the CDC," says Elward. "We knew we were statistically underpowered to determine a cause via an epidemiological study. It was reassuring that the CDC was asking the same questions we were asking. We had brilliant people from the medical center, the CDC and the FDA wrapped around this, working day in and day out."

HEPARIN RECALL
JANUARY 17, 2008

Baxter International voluntarily recalls nine lots of heparin based on reports of reactions it had received from dialysis clinics, operating rooms and critical care facilities nationwide.

The FDA and Baxter consider removing additional lots of heparin. But, given the drug's widespread use, this seems potentially more disruptive and dangerous to patients than the likelihood of widespread adverse reactions.

By February 28, the FDA concludes there is sufficient capacity on the part of other suppliers that Baxter's recall will not jeopardize access to the drug. Baxter voluntarily recalls its remaining lots of heparin.

Heparin's active ingredient itself does not escape scrutiny. Producers of it are ordered to verify the quality and safety of their ingredients.

This action turns out to be critical. ►



Protecting patients, solving a mystery: Pediatric infectious disease specialist Alexis M. Elward, MD, and nurse Marilyn L. Jones, RN, MPH, headed the hospitals' "SWAT team" as they unraveled clues related to a tainted dialysis drug.

Turns out, it wasn't the heparin after all.

Heparin is a blood thinner commonly used in patients undergoing kidney dialysis, some types of cardiac surgery, and for treatment or prevention of other serious medical conditions. It is derived from pig intestines processed primarily in small plants in China. A cheaper substitute made from animal cartilage, called oversulfated chondroitin sulfate, imitates heparin so closely that it is not recognized by routine testing. Thus this less expensive product could escape normal detection. But oversulfated chondroitin sulfate activates

enzymes that cause the body to make inflammatory mediators that can lead to symptoms such as low blood pressure, abdominal symptoms and shortness of breath.

Jones says that at the time of the crisis they didn't know it would turn into an international investigation.

"It really comes down to the astute clinicians saying, 'This is very unusual,'" says Jones. "It was our ability to quickly figure out what wasn't causing it that helped us determine that these reactions were unusual. If the FDA and CDC hadn't

"The discovery is one of the most important outcomes of an infection control investigation in years."

—GREGORY A. STORCH, MD

been called, this could have gone on much longer."

Elward agrees. "We have a good infrastructure in terms of our ability to do an investigation within the medical center. We had resources at our fingertips and were able to use the partnership between Washington University and BJC to review the literature, contact the right people, do intense data collection from charts and look at this very systematically from an epidemiologic perspective. We also have a good relationship with the local



Heparin cleared

The likely catalyst of the outbreak was not heparin, but a contaminant called oversulfated chondroitin sulfate.

Study reveals culprit in dialysis reactions

Alexis M. Elward, MD, and Marilyn L. Jones, RN, MPH, are co-authors of a paper that appeared in the December 18, 2008 *New England Journal of Medicine* in which federal agencies assert that a contaminant called oversulfated chondroitin sulfate may have been responsible for the outbreak of allergic-type reactions that occurred in dialysis patients receiving heparin in clinics nationwide in late 2007 and early 2008.

Their co-authors include researchers from the Centers for Disease Control and Prevention (CDC), Massachusetts Institute of Technology (MIT) and the U.S. Food and Drug Administration (FDA), among others.

health department and federal authorities and were able to get in touch with them immediately.”

“Dr. Elward’s swift launch into a cause for these reactions at St. Louis Children’s Hospital was exemplary,” says Alan L. Schwartz, PhD, MD, the Harriet B. Spoehrer Professor and chairman of the Department of Pediatrics. “Her attention to detail helped the state and federal authorities in their investigations and likely protected other children receiving dialysis from having similar reactions.”

Gregory A. Storch, MD, the Ruth L. Siteman Professor of Pediatrics and director of the Division of Infectious Diseases, says the discovery is one of the most important outcomes of an infection control investigation in years.

“The success of the investigation was no accident,” Storch says. “It reflected Dr. Elward’s extreme commitment to patient safety and the skill and strength of the medical center’s infection-control teams. Through tenacious investigations, Alexis Elward and her team uncovered a situation that has profound ramifications, raising questions about international production of pharmaceutical products and the role of the U.S. Food and Drug Administration.”

The reactions to contaminated heparin, as well as recent incidents of melamine tainting dairy products, led to the establishment in November



Worldwide reaction — alerts, safeguard procedures, analysis of the problem and published findings — helped make dialysis safe again for patients such as Corbin Burdick, seen here with Kira Geile, RN, in the dialysis unit at St. Louis Children’s Hospital.

2008 of FDA offices in China that will work to ensure the quality of food, drug and feed imports.

“The events in the dialysis unit at St. Louis Children’s Hospital could easily have been passed over,” says Storch. “Instead, Alexis, Anne, Marilyn and others recognized the unusual nature of the events and doggedly sought an explanation. A very strong team, their efforts were in the best tradition of ‘shoe-leather’ epidemiology.” □

The contaminant was present in nearly every instance when a patient reacted to dialysis treatment.

Of 152 adverse events studied, 99 percent of reactions occurred in patients who may have received oversulfated chondroitin sulfate-contaminated heparin. Of those patients, more than 92 percent had reactions within 30 minutes after receiving heparin manufactured by Baxter International Inc., which voluntarily recalled nine lots of its heparin from the market. Once the lots were recalled, reports of reactions dropped considerably; the last reaction reported to the CDC occurred on January 31, 2008.

The exact lot of heparin given to each patient studied could not be determined in every case because health care facilities do not routinely record the lot number of heparin at the time of administration.

Researchers from MIT tested unopened vials of heparin from nine lots linked with allergic-type reactions from facilities reporting cases. Seven of the Baxter heparin lots contained oversulfated chondroitin sulfate.

The findings also revealed that more than half of all patients that had a reaction and each of the four patients at St. Louis Children’s Hospital had preexisting allergies to different drugs.

“We wondered about medication allergies as a predisposing factor that those

patients may have already had some activation of their immune systems, so if they saw something that was a contaminant, they would be primed to have a more severe reaction,” Elward says.

The researchers reported in the *New England Journal of Medicine* paper that they found no single clinical factor that was closely associated with developing an allergic-type reaction from oversulfated chondroitin sulfate-contaminated heparin. Some of the factors that may have contributed to the reactions include age and immune status of the patient, medication dose and route, and the percentage of oversulfated chondroitin sulfate and its reaction with other biologic substances.



The first-ever **FULL-GENOME** **ANALYSIS** of one cancer patient becomes a priceless legacy

*Understanding the
dynamic gene
mutations
that eventually
took her life
will mean better
diagnoses and
treatments
in the future.*

BY CAROLINE ARBANAS

FOR THE FIRST TIME, scientists at the School of Medicine have unraveled the DNA of a cancer patient and traced her disease, acute myelogenous leukemia (AML), to its genetic roots. A large research team at The Genome Center and the Siteman Cancer Center sequenced the genome of the patient — a woman in her 50s who ultimately died of her disease — and the genome of her leukemia cells to identify genetic changes unique to her cancer.

Funded in part by a \$1 million gift from Alvin J. Siteman, the pioneering work, reported in the journal *Nature*, sets the stage for using a more comprehensive, genome-wide approach to unravel the genetic basis of other cancers. The team is now sequencing the genomes of additional patients with AML, and they also are planning to expand the whole-genome approach to breast and lung cancers.

“Our work demonstrates the power of sequencing entire genomes to discover novel cancer-related mutations,” says Richard K. Wilson, PhD, director of The Genome Center. “A genome-wide understanding of cancer, which is now possible with faster, less expensive DNA sequencing technology, is the foundation for developing more effective ways to diagnose and treat cancer.”

DANGEROUS



GENE TEAM

Richard K. Wilson, PhD,
Timothy J. Ley, MD, and
Elaine R. Mardis, PhD,
stand amid a powerful
computational cluster
housed in The Genome
Center's new, 16,000-
square-foot data center.

TIM HARRIS

Transformations

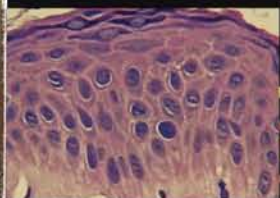
DECODING A CANCER PATIENT'S GENES

DIAGNOSIS Acute myelogenous leukemia

OBJECTIVE Compare the genes of cancer cells to healthy cells to better understand the differences

CHALLENGE Analyzing such massive data sets will require an innovative, strategic approach

HEALTHY CELLS



CANCER CELLS



BASE PAIR

VARIATION

3,000,000,000

The number of base pairs in the complete human genome.

2,700,000

Base pair variants that identify this person as unique.
The question is, which ones are linked to cancer?

2,640,000

Cancer cell variations that match variations also found in the patient's healthy cells.

60,000

Suspicious variations to investigate.

10

Using new tools and strategies, researchers identify 10 mutations that may have triggered the deadly cancer.

At the root of every cancer lies a genetic glitch, a slipup that begins with one mutation and ends with a tumor. Researchers looking for cancer-causing mutations have spent decades scouring suspect genes for clues to the disease. But the task of unraveling cancer in an individual patient has remained out of reach — until now.

Washington University researchers discovered just 10 genetic mutations in the AML patient's tumor DNA that may have caused her disease or promoted its progression. Eight of those were rare and occurred in genes never before linked to AML.

They also showed that virtually every cell in the tumor sample had nine of the mutations, and that the single genetic alteration that occurred less frequently was likely the last to be acquired.

Like most cancers, AML — a cancer of blood-forming cells in the bone marrow — arises from mutations that amass in people's DNA over the course of their lives. However, little is known about the precise nature of those changes and how they disrupt biological pathways to cause the uncontrolled cell growth that is the hallmark of cancer.

Previous efforts to decode individual human genomes have looked at DNA variations that may be relevant for disease risk. What's striking about the new research is that the scientists were able to sift through the 3 billion pairs of chemical bases that make up the human genome to pluck out the mutations that contributed to the patient's cancer.

"Until now, no one had sequenced a patient's genome to find all the mutations that are unique to that person's disease," says Timothy J. Ley, MD, the Alan A. and Edith L. Wolff Professor of Medicine, who led the project. "We didn't know what we would find, but we felt that the answers to why this patient had AML had to be in her DNA."

To date, scientists involved in large-scale genetic studies of cancer have not done a full side-by-side comparison of the genomes of normal cells and tumor cells from the same patient. Rather, earlier studies have involved the sequencing of genes with known or suspected relationships to cancer, a method that likely misses key mutations.

The new research has been hailed as a true landmark in cancer research by other scientists, including geneticist Francis S. Collins, MD, PhD, former director of the National Human Genome Research Institute. "In the past, cancer researchers have been 'looking under the lamppost' to find the causes of malignancy, but the Washington University team has lit up the whole street," says Collins. "This achievement ushers in a new era of comprehensive understanding of the fundamental



patient's skin sample. This narrowed the number of suspicious variants to about 60,000.

Using sophisticated software and analytical tools, some of which the researchers developed specifically for this project, they identified the 10 mutations (including the two previously known genetic mutations that are common to her leukemia subtype but do not directly cause the disease) by looking for single base DNA changes that altered the instructions for making proteins.

Of the eight novel mutations discovered, three were found in genes that normally act to suppress tumor growth. Four other mutated genes appear to be involved in molecular pathways that promote cancer growth. In particular, one mutation was found in a gene family that also is expressed in embryonic stem cells and may be involved with cell self-renewal, a process researchers think may be an essential feature of leukemia cells.

Another gene alteration appears to affect the transport of drugs into the cell, and may have contributed to the patient's chemotherapy resistance.

"We're still analyzing the patient's non-coding DNA and expect to find a number of additional relevant mutations in this portion of the genome," says Elaine R. Mardis, PhD, co-lead author of the study and co-director of The Genome Center. "But the role of these non-coding mutations will be more of a challenge to elucidate because we do not yet fully understand the function of this part of the genome."

The team also determined that the eight novel mutations in the patient's tumor genome did not occur in the DNA of tumor samples from 187 additional AML patients.

"This tells us there is a tremendous amount of genetic diversity in cancer, even in this one disease," Wilson says. "There are probably many, many ways to mutate a small number of genes to get the same result, and we're only looking at the tip of the iceberg in terms of identifying the combinations of genetic mutations that can lead to AML."

Based on their current understanding of cancer, the researchers suspect that the mutations occurred sequentially. The first mutation gave the cell a slight tendency toward cancer, and then one by one, the other genetic alterations were acquired, with each contributing something to the cancer. One mutation, in the FLT3 gene, was not present in all of the tumor cells, and they suspect that it was the last one to occur.

"The final mutation may represent a tipping point that causes the cancer cells to become more dangerous," Ley says. □

Each colored dot in the image above, obtained from the Illumina Genome Analyzer II sequencer, represents a cluster of DNA fragments with the same sequence. By adding a fluorescent dye-labeled nucleotide during sequencing, each of the four bases in DNA (A,C,G,T) has a specific color to identify it. At left, a technician prepares for a sequencing run.

"We didn't know what we would find, but we felt that the answers to why this patient had **AML** had to be in her **DNA**."

— Timothy J. Ley, MD

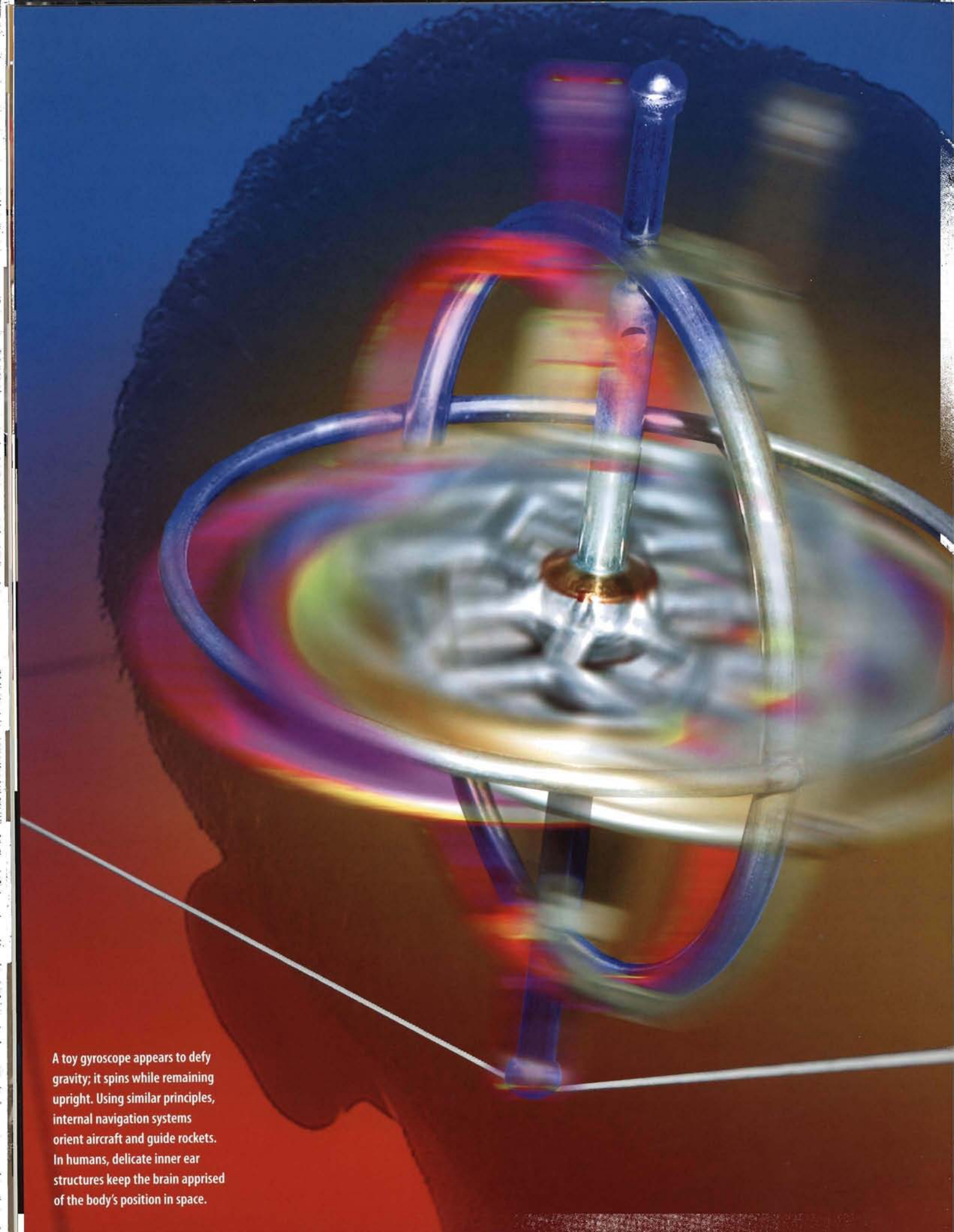
nature of cancer, and offers great promise for the development of powerful new approaches to diagnosis, prevention and treatment."

An estimated 13,000 cases of AML will be diagnosed in the United States this year, and some 8,800 people will die of the disease. AML occurs most often among those age 60 or older and becomes more difficult to treat as patients age. According to the American Cancer Society, the five-year survival rate for AML is just 21 percent.

The bleak statistics are all too real to Ley. "It is very discouraging that more progress has not been made for patients with AML," he says. "We treat these patients today in much the same way that we did 20 years ago. If we're ever going to understand cancer, we need to understand the whole genomes of cancer patients. We felt that with new genome sequencing technology, now was the time to take a whole-genome approach."

The researchers sequenced the patient's full genome — DNA from both sets of chromosomes — using genetic material obtained from a normal, healthy skin sample. This gave them a reference DNA sequence to which they could compare genetic alterations in the patient's tumor cells, taken from a bone marrow sample. Both samples were obtained before the patient received cancer treatment, which can further damage DNA.

The scientists then looked for differences — points of single DNA base changes — in the patient's tumor genome compared with the genome of her skin sample. Of the nearly 2.7 million single nucleotide variants in the patient's tumor genome, almost 98 percent also were detected in DNA from the



A toy gyroscope appears to defy gravity; it spins while remaining upright. Using similar principles, internal navigation systems orient aircraft and guide rockets. In humans, delicate inner ear structures keep the brain apprised of the body's position in space.

WHAT'S UP?



Critical inner ear structures answer this question.

But not always.

A wearable device could restore the balance.

BY GWEN ERICSON

John A. Blumenfeld, a lawyer based in Clayton, Missouri, is missing something most people take for granted — a sense of balance. It's not just that he can't walk a tightrope without a net. It's that he has trouble walking anywhere that's not smooth, flat and well lit — a thick lawn, a slanting sidewalk, a dim hallway.

"Any time I'm walking, my main objective is to avoid falling," Blumenfeld says. "It's not an easy task because I feel unsteady. It's something that's always with me, and it's not pleasant."

He sought help from Joel A. Goebel, MD, director of the Dizziness and Balance Center at the School of Medicine. Goebel started Blumenfeld on vestibular rehabilitation exercises, which teach him to compensate for his loss of vestibular, or inner ear, function. But Blumenfeld also agreed to participate in the testing phase of a device that could some day help many people with balance disorders.

The device, worn on the head, alerts wearers that they are leaning so they can upright themselves — something people with healthy inner ear function usually do without thinking.

"We saw such a strong positive effect in our preliminary trial that the funding agency, the National Institutes of Health, recommended we move forward with a second, broader trial of the device," says Goebel, professor and vice chairman of the Department of Otolaryngology. "The first trial tested the device on people with complete vestibular loss in both ears. We believe that if we can help that group of patients, we can certainly help the larger group who still retain some vestibular function."



Charging up to 70 miles per hour, a cheetah's body moves in frenzied rhythms while its head remains relatively stable. This helps it monitor one constant: gravity. Although vision and other senses add vital information, the animal's brain relies on its vestibular system's unerring reference point. Most humans (moving more slowly, of course) take for granted similar, essential functions. But when a human's vestibular system becomes damaged, other senses cannot fully compensate for the loss, and walking becomes difficult. Researchers wondered whether an artificial system could monitor spatial position and provide feedback. *In essence, could the patient's brain be retrained?*

Retraining THE BRAIN

TO RESTORE A SENSE OF BALANCE

A WELL-BALANCED WORLD

Visitors to the Dizziness and Balance Center soon meet Gertrude. This styrofoam head became the researchers' companion as she modeled prototypes of a balance-assist device. With further development, it is hoped that one day Gertrude's strappy headgear may be hidden in a stylish hat, and the size of the computing devices similarly minimized.

More significant than appearance or convenience, however, is the question of whether the human brain can functionally adapt to these new stimuli. To find out, researchers unstrap Gertrude and transfer the device to safely harnessed human subjects.



PITCH Shaking head "yes"

YAW Shaking head "no"

ROLL Tilting head to the side



Joel A. Goebel, MD, and Belinda C. Sinks, AuD, display Gertrude and her high-tech accessories.

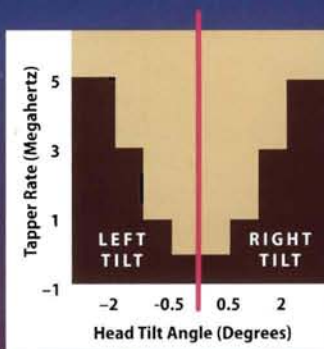
GYROSCOPE

A digital gyroscope attached to the back of the headband monitors head position relative to the environment.



TAPPERS

Tappers positioned alongside the head — front, back, left and right — provide sensory cues whenever the person veers "off course."



FEEDBACK

If the person doesn't immediately correct vertical position, the taps increase in frequency: a slow tap for one degree of tilt, fast for two degrees, and very fast for three degrees.



PLATFORM TEST

During lab tests, safely secured subjects respond to the device within a phone-booth-size artificial environment. Its disorienting, pivoting floorboard and landscape throws them off balance while researchers monitor results.



BRAIN POWER

Unlike the compact complexity of the brain's natural computing power, this circuitry must be worn in a backpack or connected externally. The goal is to develop a miniaturized package for people on the go.



WHAT'S UP? Balance disorder research

To stand, walk, run or ride a bike, people rely greatly on the sensory apparatus of the vestibular system located in the inner ears. Two million people in the United States live with chronic imbalance as the result of vestibular system malfunction. Imbalance interferes with daily life and increases the risk of falls, which can be deadly in those who are frail.

But people aren't completely dependent on the vestibular system for balance. When they lose some or all of its function, as Blumenfeld did, they can use other senses to tell them what's up and what's down. Visual cues from their surroundings and nerve signals indicating the position of their feet, limbs and torso can allow them to get around. But those balance strategies take continual conscious effort. Furthermore, vision can't help when it's dark, and soft surfaces can easily throw off a person's sense of what's underfoot.

Two years ago, Barron Associates Inc., a research and development company, approached Goebel about working with them to develop technology for preventing seasickness in naval servicemen. That morphed into a project to address balance problems in those with vestibular malfunction.

Goebel, along with two researchers at Princeton University and two technical experts from Barron, outlined a proposal that won a small-business innovation research grant from the NIH, a type of award that backs research with commercial potential. They put together a prototype device based on the theory that a tactile sensation, a touch, could become a substitute for the unconscious senses that normally keep people from falling over.

The early version of the device, admittedly a little cumbersome, consists of headgear wired to a computer. The headgear senses how many degrees from vertical the wearer's head inclines and through a connected computer communicates with four mechanical tappers on the sides, front and back of the head. The tappers very gently strike the wearer's head, tapping slowly for one degree of tilt, fast for two degrees and very fast for three degrees.

Blumenfeld was one of nine subjects who visited Goebel's balance lab to find out if that tapping could minimize falls. Clinical audiologist Belinda C. Sinks, AuD, supervises the

lab and oversaw the test participants. She placed the volunteers on a platform that could freely tilt around a center point. A harness and support straps prevented them from falling over completely.

"The therapist tilts the platform this way and that way to see how you react," Blumenfeld says. "The headgear gives you a signal. It's a barely noticeable tap."

Blumenfeld says that he found the tests difficult. That's likely because he was part of a group that got tapped on the side of the head away from the direction of lean. That is, if he was tipping forward, the device tapped the back of his head, basically saying, "Lean toward me." The other group of test subjects got tapped from the direction of lean. When they leaned to the left, for example, the tapper on the left activated. For them, the tapping was a warning to lean away.

"That turned out to be much more intuitive," Goebel says. "When you are falling in a crowd and somebody catches you, they'll push you back. You move away from the pressure of their hand. That's the natural reaction."

For the second group, the device worked very well; they were able to avoid falling more often than the other group. When they did fall, it was after a longer time on the platform. And they were better able to use corrective movements of their ankles and hips to remain standing.

The company is now building a more compact version of the device, and Goebel has received funding for a second, more extensive testing phase that will include patients with a wider range of balance disorders. This study will determine whether performance improves over time and whether the benefit continues after patients stop using the device. Goebel believes a marketable product, a device incorporated into a hat or scarf, could be ready within the next two years.

For people like Blumenfeld, the balance-correction device could bring a welcome measure of confidence and freedom. "My wife and I used to like to go on tours, but we stopped traveling when I developed this problem," he says. "And two years ago I fell and needed a hip replacement because of the disorder. I want to do what I can to help research to ameliorate the problem for others." □

"It's a start": Lawyer hopes this research will one day benefit others with balance disorders

While the balance correction device used in Goebel's clinical trial may not have benefited John A. Blumenfeld directly, he was impressed with its potential. He and his wife decided to give a gift of \$25,000 to the School of Medicine to promote Goebel's research by establishing the John and Laura Blumenfeld Research Fund



for Balance Disorders in the Department of Otolaryngology.

"It's a start," Blumenfeld says. "I hope to supplement it and encourage others to contribute. I'm very pleased to be able to help advance research on balance problems."

In 1950, Blumenfeld was a founding partner in the firm of Blumenfeld, Kaplan and Sandweiss PC. The firm was acquired by Stinson Morrison Hecker LLP in 2007, and Blumenfeld remains a consulting partner.

He has been listed in *The Best Lawyers in America in Real Estate Law* for 20 years.

Blumenfeld earned his law degree from Washington University in 1948, and his family has strong ties to the university. His mother-in-law, eldest son and a daughter-in-law earned law degrees from the university, two other sons earned masters in business administration, and one of his daughters earned a masters of fine arts. "We're dug in over there," Blumenfeld says.

100 YEARS AGO, administrators were advised to

ABOLISH THE SCHOOL.

Fortunately, *they did*, and so a faltering medical college exchanged certain mediocrity for potential excellence.



When Flexner saw the future

BY CANDACE O'CONNOR

Although this faded typescript is somewhat hard to read today, it was very difficult to read for different reasons in 1909, when it shocked the university community out of complacency.

A REPORT OF THE MEDICAL DEPARTMENT OF WASHINGTON UNIVERSITY.

Washington University is an ambitious and substantial institution, important now, and destined to be of increasing importance to the people of St. Louis and the surrounding country. It occupies a noble site; architectural plans already partly realized promise it a home not likely to be surpassed in the entire country.

Its medical department is entirely out of harmony with the spirit and equipment of the rest of the University. Unless this department is to be a drag and a reproach, one of two courses must be adopted: the department must be either abolished or reorganized.

In the interest, not only of St. Louis, but of the entire Southwest, it is earnestly to be hoped that the latter alternative will be adopted. There are comparatively few places in which modern medical instruction can be carried on without handicaps of one kind or another. It requires - unless great expense in procuring material is to be incurred - a great city: St. Louis is such a city. It requires the stimulus, cooperation and aid of a University: Washington University is such an institution. The combination is none too frequently found. In the Southwest it is found in St. Louis alone. Inverities have usually been placed in small, sometimes rather inaccessible, towns. It is difficult to promote medical education in such places. Such a situation is not likely to be improved by the present conditions.



Abraham Flexner

IN APRIL 1909, a wiry, intense man jumped off the train in St. Louis, bound for Washington University's Medical Department. Abraham Flexner had

been traveling the country on behalf of the Carnegie Foundation, studying the quality of American medical schools — and so far it had been a dismal journey. Nearly everywhere, he had found shoddy facilities and inadequate curricula. Within a year, he would publish his findings in a watershed book, *Medical Education in the United States and Canada*, that led more than 100 schools to close and others to undertake sweeping reforms.

"One hundred years ago, the Flexner report catalyzed a major transformation of medical education," says Larry J. Shapiro, MD, executive vice chancellor for medical affairs and dean of the School of Medicine. Adds Thomas N. Bonner in his book, *Iconoclast: Abraham Flexner and Life in Learning*: "America owes to Flexner, more than any other person, the rapid implementation of the full-time medical school, allied to a teaching hospital, and integrated into a university."

But on the St. Louis leg of his trip, Flexner must have felt a glowing sense of anticipation. The man who had hired him, Henry Pritchett, had once been a mathematics and astronomy professor at Washington University, where he had forged a lasting friendship with its board chairman and benefactor, Robert Brookings. Now Pritchett assured Flexner that he would finally strike gold. "You are going to see something better," he said proudly, "for my friend Brookings has taken particular interest in developing the medical school."

Flexner's 1910 publication, critical of medical education

Pritchett was dead wrong. During his two-day study of the medical school, Flexner was horrified to find "the school a little better than the worst I had seen elsewhere, but absolutely inadequate in every essential respect." Disappointed but staunchly supportive, Pritchett sent the report off to Robert Brookings, who had not even known that Flexner was in town. "I was so indignant on receipt of this report that I protested to Dr. Pritchett," wrote Brookings, a man with a big temper.

Still, Brookings must have suspected, deep down, that Flexner was right. For one thing, Flexner — formerly an educator himself, who had already written a critique of American higher education — had a solid context for his criticism. He had begun his work in December 1908, charged with visiting 155 medical schools across the United States and Canada.

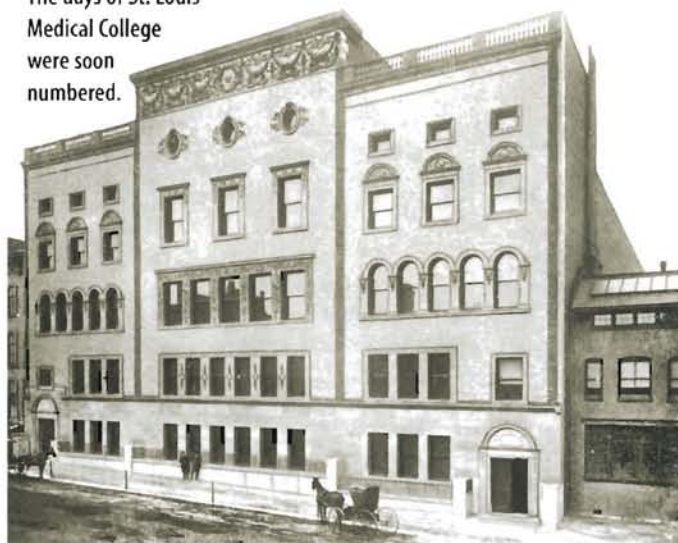
And his employer, the Carnegie Foundation, was an independent agent, seeking only to discover the truth. Founded in 1905 by industrialist-turned-philanthropist Andrew Carnegie, it was dedicated to advancing the profession of teaching. At its head was Pritchett — the soul of rectitude — who had begun life as the son of a teacher in tiny Glasgow, Missouri, and whose talent had propelled him from Washington University to the presidency of Massachusetts Institute of Technology before Carnegie hired him away.

Further, Brookings had recently met with Daniel C. Gilman, the president of Johns Hopkins University, which had the nation's most progressive medical school and hospital, so he was uncomfortably aware that his medical school was not in the same league. At a speech before the Commercial Club that October, Brookings had bragged



Angered by Flexner's damning report, Robert S. Brookings later accepted its hard conclusions.

The days of St. Louis Medical College were soon numbered.



schools, became a turning point that informed the betterment of American medical education.

about Washington University, yet he couldn't muster his usual enthusiasm in promoting the Medical Department. At one point he asked the crowd, rather wistfully: "How long will it be before some wise philanthropist gives to St. Louis ... a hospital to be affiliated with our Medical School?"

So when he and David Houston, the university's new chancellor, received Flexner's report, they soon regrouped. Late in May 1909, Houston called a meeting of medical faculty to talk about reform. To their great credit, these physicians declared that they supported substantial overhaul. It would be impossible, said pathologist and one-time dean Gustav Baumgarten, MD, "to improve the old system with minor changes" — whatever the consequences to their own positions.

Actually, this group of physicians had long hoped for change. The Medical Department where they taught was formerly the St. Louis Medical College, acquired by the university in 1891; it had expanded in 1899, when it merged with the Missouri Medical College. This combined school was located at 1806 Locust, part of the university's dingy, downtown campus, while the 125-bed Washington University Hospital was in the lightly revamped Missouri Medical College building at Jefferson and Lucas.

Neither building was adequate to its purpose. As one student said of the medical school: "The floors are dirty; tables, chairs, everything covered with the grime and soot of years. This in a school whose professors are trying to teach methods of cleanliness." And a poorly defined set of courses was taught by a large, part-time staff, all of whom had busy clinical practices. One dean, William H. Warren, complained openly of "lectures extemporized in the automobile."

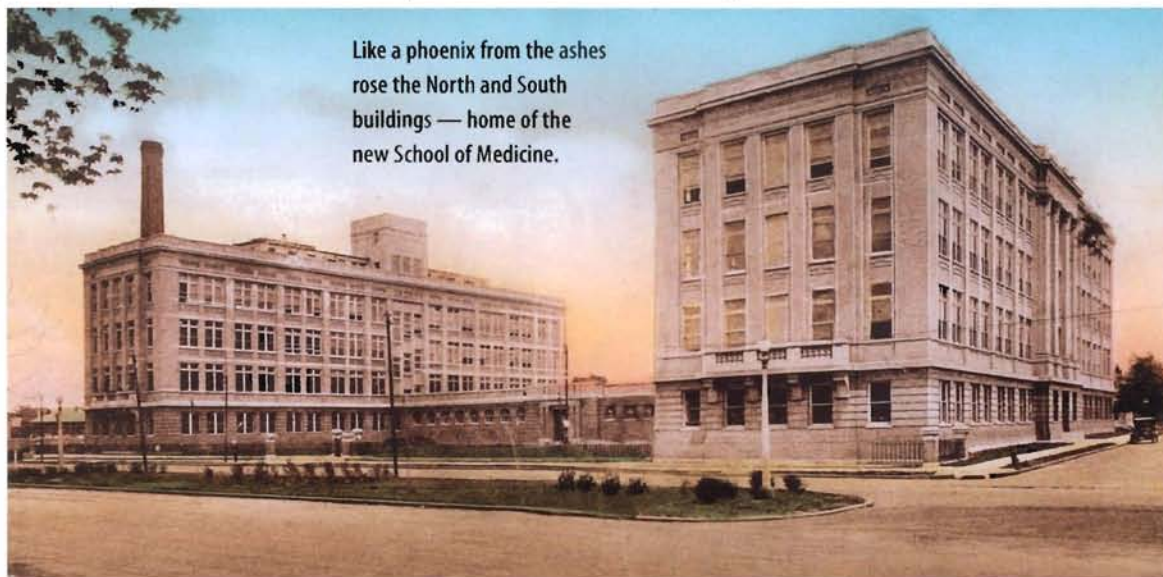
With the blessing of the board, Brookings and Houston jumped into action, establishing a reorganization committee composed of Brookings' three closest friends: William Bixby, Robert McKittrick Jones and Edward Mallinckrodt. Now Flexner made plans to return to St. Louis, with firm instructions from Pritchett to meet with Brookings and show him exactly what was wrong.

Reflecting on the legacy of Flexner's report: "Every day we reaffirm the commitment to excellence made 100 years ago," says Larry J. Shapiro, MD.



As he later wrote, Flexner took Brookings on a revealing tour. "We went to the dean's office, and I asked to see the credentials of the students of the school, for the school pretended to require a flat four-year high-school education of all entering students. It was quickly apparent to Mr. Brookings that no such requirement was being enforced. We went through other departments, not one of which was found to be what the catalogue represented. Within less than two hours, Mr. Brookings was completely satisfied."

To the reorganization committee, Flexner offered further advice: "Abolish the school. ... Form a new faculty, reorganize your clinical facilities from top to bottom, and raise



Like a phoenix from the ashes rose the North and South buildings — home of the new School of Medicine.

an endowment which will enable you to repeat in St. Louis what President Gilman [of Johns Hopkins] accomplished in Baltimore." Though it was not yet clear where the funding would come from, the committee voted to proceed with this plan.

In consultation with William H. Welch, dean of the Johns Hopkins School of Medicine, Flexner suggested that the university invite brilliant young David L. Edsall, MD, from the University of Pennsylvania, to guide the reform process. Edsall came and spun exciting images of a new hospital, laboratory space, and a full-time faculty of stars — in short, "an ideal medical school." A born dreamer, Brookings was hooked and promptly donated \$500,000 of his own money to the project. A brand new Washington University School of Medicine was on its way.

"Robert Brookings seized the opportunity to reshape the Washington University School of Medicine around an enduring commitment to excellence in all that we do," says Shapiro. "Now, a century later, it is time to reaffirm our commitment and our resolve to continue to lead the way in medical and scientific education, in fundamental and applied research, and in the highest quality of compassionate service to our patients." □



A 19th-century movement to bring medical knowledge to the people may have influenced Emily Dickinson's poetry.

WHERE POETS PREDICTABLY SING of the eyes, brows, lips, hearts, and hands of their affections, Emily Dickinson, by comparison, wrote of — *veins, arteries, brains, nerves, lungs, cells, muscles, bones*. Somehow, for her, medical terms became poetic metaphors. How this happened, and its significance for Dickinson's legacy, is the study of a scholar whose interests bridge literature and science.

Barbara A. Baumgartner, PhD, senior lecturer and associate director of the Women, Gender and Sexuality Studies Program at the Danforth Campus, speculates that an anatomy class — in particular, a remarkable textbook used to teach it — may have profoundly influenced Dickinson's poetry.

In "Anatomy Lessons: Reading the Body in Emily Dickinson's Poetry," Baumgartner presented her ideas as part of the *Historia Medica* series at the Bernard Becker Medical Library.

Poetry and medicine come naturally to Baumgartner. "I thought I was leaving nursing and medicine behind," she says of her decision to end a 13-year nursing career to pursue a doctorate in English. Yet she came full circle when she wrote her dissertation on bodily violence in 19th century American women's writing. "I began a pattern of combining my interests in the body and medicine with my study of literature."

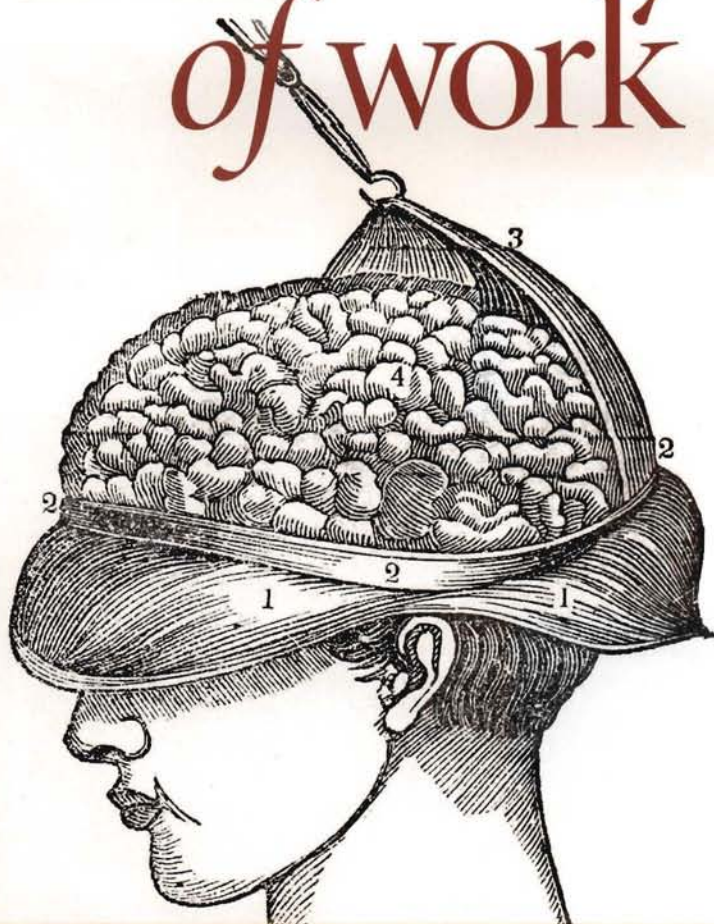
That explains Baumgartner's medical background. But for Dickinson, the connection began at Mt. Holyoke Female Seminary in the late 1840s.

In an era of blood-letting, blistering and purgatives, medical treatments were often as bad as disease. A vigorous reform movement — with popular lectures, periodicals and books — developed in response to Americans' growing dissatisfaction with such health care practices. By 1850, Massachusetts required the teaching of anatomy and physiology. Mt. Holyoke, however, ahead of its time, already included physiology as required curriculum.

Dickinson, who said that she was "much interested" in the subject of anatomy, was assigned to read *Anatomy and Physiology: Designed for Academies and Families*, by physician Calvin Cutter. His best-selling anatomy text, first published in 1847, displays more than 200 engravings across its 300-plus pages. Each chapter features a particular area of the body, describes functional systems and explains biological processes.

As a gender scholar, Baumgartner marvels at Cutter's remarkably egalitarian book.

Her body of work



The beautiful and the bizarre: Did illustrations such as this one, exposing the organ of the brain within the body, aid Dickinson's conceptual integration of mind and body?

TREATISE
ANATOMY,
PHYSIOLOGY, AND HYGIENE:

DESIGNED FOR
COLLEGES, ACADEMIES, AND FAMILIES.

BY
CALVIN CUTTER, M. D.

WITH ONE HUNDRED AND FIFTY ENGRAVINGS.

STEREOTYPE EDITION.

BOSTON:

BENJAMIN B. MURPHY AND CO.

NEW YORK: PLASK, LITTLE, AND CO. BALTIMORE: GREEN AND
ANDERSON. PHILADELPHIA: A. C. SPENCER AND SONS.
ANNAPOLIS, MD.: L. HART AND SONS.
BALTIMORE: R. M. DODGE AND CO.
BOSTON: A. W. MERRILL AND CO.
1829.

Bernard Becker Medical Library
has several editions of a
groundbreaking textbook that
Emily Dickinson studied.

In it, he frequently adopts genderless terms, using “person,” “individual” or “one,” while minimally using the masculine pronoun “he.” In one passage, Cutter mixes his society’s distinctly masculine and feminine roles when he writes of a person *speaking, reading, singing, mowing, sewing.*

Such equal billing of the sexes was unusual for the time.

“In a society that emphasized the profound, fundamental, and innate opposition between men and women,” says Baumgartner, “such an approach must have been unusual, as well as refreshing.”

One illustration showing scalp and skull stripped away to reveal the brain stands out for Baumgartner. She wonders if it did for Dickinson, too, who later wrote in a letter: “If I read a book [and] it makes my whole body so cold no fire ever can warm me I know *that* is poetry. If I feel physically as if the top of my head were taken off, I know *that* is poetry. These are the only way I know it. Is there any other way.”

Cutter identifies the brain as the “organ of the mind” that controls all bodily functions, emotional and physical. In fact, the brain is mentioned in almost every chapter, underscoring the modern understanding of its significance.

“Despite its inextricable connection to the body,” says Baumgartner, “the brain is also depicted, in both description and illustration, as autonomous, even separate from the body,” stripped of its supporting and connective structures, leaving an isolated, independent entity.

How might all this have affected Dickinson?

She wrote “brain” poems that also remove this organ from context. In these poems, the brain is depicted as having an existence apart from the body. “It stands on its own,” says Baumgartner, “as a separate or a sentient organism.”

Placing these poems — and her creative powers — within the brain, Dickinson selects a structure which 19th-century anatomists believed to be the intersection of the physical and the spiritual.

This is surprising, because “unlike the heart, which has had a long literary tradition as a conventional trope that authors employ to express strong feelings and subjectivity,” says Baumgartner, “the brain is not commonly used as an image or symbol to represent emotion or the self.”

In creating a genderless speaker, in blurring distinctions between literal and figurative views of the world, Dickinson upends 19th-century poetic practice. Moreover, Baumgartner contends that in challenging the mind-body dichotomy, Dickinson upsets a Western philosophical tradition as old as Plato — one that characterizes the mind as superior in opposition to the inferior body.

Central to this longstanding philosophical dualism is the association of mind with male and body with female. By contrast, Baumgartner says that in the brain poems “Dickinson does not rely on this binary split between mind/body, inside/outside, male/female, nor does she privilege one domain over the other.”

Instead, Dickinson places the mind and body on an equal level: One where the mind *is* the body and vice versa.

By setting poems within the interior landscape of the body, Baumgartner believes that Dickinson challenged the characterization of women *as* body.

“In the ‘brain’ poems, mind and body are interdependent, biological sex is absent, bodily parts do not masquerade as the whole, relationships between exterior and interior become more fluid and interdependent,” says Baumgartner. “In this way, Dickinson’s poems anticipate and are in dialogue with recent feminist attempts to reconceive the mind/body binary and replace it with a more integrated model.”

The mid-19th century health reform movement brought medical information to the people. Placing Dickinson in this context certainly invites a fresh reading of her poetry.

More importantly, however, Baumgartner sees these poems as a model for reconsidering subjectivity and the body — one that integrates the psychological with the physiological in ways that now seem so far ahead of their time. □

BY ERIC YOUNG



19th-century reform movement:
Cutter portrays incorrect posture.



Barbara A.
Baumgartner, PhD

The art of healing

Pediatric neurologist gives generously of his time and passion

Arthur L. Prensky, MD, always dreamed of becoming a historian and was accepted into graduate school at Harvard University. But a pivotal event of the 1950s, the Korean War, would alter his career path. When he joined Advanced ROTC to fund his undergraduate studies at Cornell University, the world was at peace. In 1951, the year he graduated, that peace had been shattered by a controversial war overseas, and he chose medical school over the military.

Prensky, the Allen P. and Josephine P. Green Professor Emeritus of Pediatric Neurology, applied to a number of medical schools. He was accepted at New York University College of Medicine, where he excelled and developed an interest in neurology. But his enthusiasm for medicine waned during his clinical rotations.

While completing an internship in internal medicine at Washington University School of Medicine, however, he had a change of heart. He was struck by the professionalism, clinical skills and character of the physicians he met.

The mentoring and support Prensky received helped to launch his long, distinguished career, which includes groundbreaking research in lipid chemistry and myelin, new diagnostic procedures



Patrons of the Mildred Lane Kemper Art Museum on the university's Danforth Campus will benefit from the Prenskys' gift of the works of more than 100 noted contemporary artists, including Roy Lichtenstein, Jasper Johns and Keith Haring.



“I enjoyed buying art, and she enjoyed looking at it,” says Arthur L. Prensky, MD, of his late wife, Sheila.

for spotting migraines in children and the first endowed professorship in child neurology in the United States.

After Prensky’s internship in medicine, James L. O’Leary, MD, PhD, then the chairman of neurology, took an interest in him and secured a postponement of his ROTC duties first through a School of Medicine fellowship in experimental neurology and then as the neurologist at the U.S. Air Force School of Aviation Medicine. As an Air Force captain based in San Antonio, Texas, Prensky taught flight surgeons and treated aviators with neurological problems.

Prensky then moved to Boston, where he completed residencies and fellowships in neurology at the Lemuel Shattuck Hospital and Massachusetts General Hospital. He became an instructor at Harvard Medical School in 1966, but was recruited to Washington University the next year by Philip R. Dodge, MD, who left Harvard to become chairman of the Department of Pediatrics at the School of Medicine.

Prensky met his late wife, Sheila Carr, in a chemistry laboratory when they both worked at Massachusetts General. She earned extra money by typing papers and drawing charts. When they moved to St. Louis, she worked for the Department of Pediatrics as an artist, making drawings and graphs and shooting photographs.

The couple shared a love of art and decided to start their own corporation, Carr Art Graphic, in the early 1970s. When Prensky lectured in larger cities, Sheila would accompany him, and they would meet with local galleries and printers to purchase art. Over the years, they built up an impressive personal collection of 80 lithographs and some original abstract paintings, including pieces by Donald Sultan, Sam Francis and Andy Warhol.

“Sheila didn’t enjoy spending money,” Prensky says. “But I enjoyed buying art, and she enjoyed looking at it.”

The couple has made generous gifts, including portions of their art collection, to the Sam Fox School of Design and Visual Arts and the Mildred Lane Kemper Art Museum.

Prensky also intends to support the School of Medicine and the Department of Neurology through his estate plan because he enjoyed practicing pediatric neurology at Washington University for more than 40 years.

“Arthur Prensky has enjoyed an illustrious career in pediatric neurology,” says Michael J. Noetzel, MD, director of the School of Medicine’s Division of Pediatric and Developmental Neurology. “Following his arrival in St. Louis, he directed one of the country’s largest and most productive divisions of pediatric neurology and an equally impressive training program in child neurology. He also has published extensively and provided national leadership as president of the Child Neurology Society. However, Arthur’s most enduring legacy is that for more than 40 years he has been an excellent physician, a caregiver dedicated to his multitude of patients, and an exemplary role model for child neurologists at all stages of their careers.”

Prensky continues to see patients in the pediatric neurology clinic one afternoon each week. He also supervises residents two afternoons each week as an attending physician in pediatric neurology.

“There still is a vast amount of neurological disease, such as mental retardation, that we don’t understand,” Prensky says. “I hope this gift will help us find more causes of neurological disease, which will help families determine whether future children they have will be at risk.”

Prensky thought he would spend his life lecturing about history. But when he reflects on his medical career, he is proud of the students he taught, the patient care he provided and the neurological research he conducted. He also has a special affinity for Washington University.

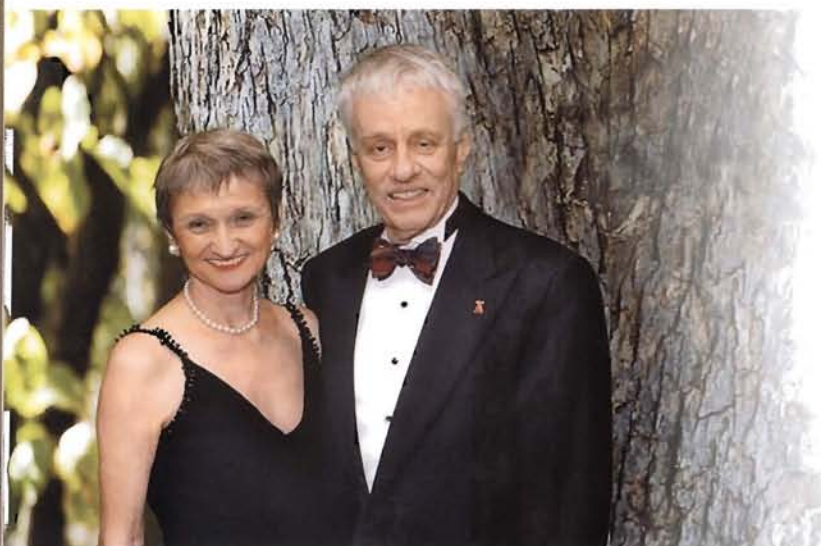
“I’ve spent most of my life here,” he says. “Years ago, I felt that Washington University was one of the most overlooked places in the country. Yet, it’s been a top-notch school for many decades and is always getting better. It made me want to support it.”

From the heart

Cardiologist supports student scholarships



New diagnostics signal
a new era in cardiology.



When Charlie W. Shaeffer, MD 64, decided to specialize in cardiology in 1967, the only tools a cardiologist had to work with were a patient's history, a physical exam, a chest X-ray and an electrocardiogram.

Today cardiologists have a battery of tools at their disposal, including magnetic resonance imaging, more effective medications, and procedures such as coronary angioplasty. A patient having a heart attack in the 21st century who makes it to the hospital alive has a 95 percent chance of surviving and returning to a normal life.

"There have been many exciting developments in the past four decades that have improved diagnoses and treatments," says Shaeffer, a consultative cardiologist in Rancho Mirage CA. "I've never regretted my decision."

Shaeffer says the School of Medicine not only provided him with a solid foundation for his medical career, but also taught him how to think — not to just memorize a collection of facts and solutions. He especially enjoyed the lectures of Carl A. Moyer, MD, head of the Department of Surgery, known for his dynamic, collaborative teaching. "Those years also were an opportunity to interact with many bright students in a challenging learning program," he says.

He and his wife, Claire, married while both were attending Florida State University. Before Shaeffer began his medical training at the School of Medicine, the couple had their first son. Shaeffer says he is grateful for the financial support he received during medical school. "Without my Danforth

"Without my Danforth Scholarship, I could not have afforded to attend Washington University."

Charlie W. Shaeffer, MD 64, pictured with his wife, Claire

Scholarship, I could not have afforded to attend Washington University," Shaeffer says.

Over the years, the Shaeffers have supported the Class of 1964 Scholarship and the Medical Teaching Fund at the School of Medicine.

Recently, they gave a gift that will establish the Charlie W. Shaeffer, MD, Endowed Scholarship Fund. This scholarship will be awarded on academic merit and/or financial need.

"Medicine needs to attract the best and the brightest," says Shaeffer. "Claire and I feel this is an opportunity to give future students an opportunity similar to the one the Danforth Scholarship provided me."

Claire Shaeffer is an author of fashion sewing books, with four books currently in print. Her areas of expertise are the techniques used in haute couture and the production of ready-to-wear. She travels the country teaching sewing enthusiasts the workroom secrets of the world's couturiers, including Dior, Chanel and Givenchy.

The Shaeffers have resided in Palm Springs, California, since 1974, drawn there by its small-town atmosphere. They have two sons and two grandchildren. Both of their sons majored in engineering, and one son, James, is a graduate of Washington University.

The couple enjoys the opera and museums. They also take pleasure in traveling, having recently returned from their first cruise last year — a Washington University alumni cruise to Antarctica.

A commitment to academic excellence

Endowed professorships are among the highest accolades that a university can bestow upon its most distinguished faculty. At the School of Medicine, these physicians and scientists inspire students and trainees, expand the frontiers of knowledge, make discoveries that change lives, and lead dynamic medical programs. Endowed professorships are a mark of distinction for the donors who establish them and who are recognized in perpetuity. Washington University recently recognized three newly installed professors and the exceptional donors who made these professorships possible.

Martin I. Boyer, MD

*The Carol B. and Jerome T. Loeb
Professor of Orthopaedic Surgery*

Dean Larry J. Shapiro, MD, Martin I. Boyer, MD, FRCS(C), Mrs. Carol B. Loeb, Richard H. Gelberman, MD, head of the Department of Orthopaedic Surgery, and Chancellor Mark S. Wrighton, PhD, gather to mark Boyer's installation as the Carol B. and Jerome T. Loeb Professor of Orthopaedic Surgery.



C. Michael Crowder, MD, PhD

*The Dr. Seymour and Rose T. Brown
Endowed Professor of Anesthesiology*

Celebrating the installation of C. Michael Crowder, MD, PhD, as the Dr. Seymour and Rose T. Brown Endowed Professor of Anesthesiology are Crowder, Mrs. Rose T. Brown and Alex S. Evers, MD, head of the Department of Anesthesiology.



Alex A. Kane, MD

*Dr. Joseph B. Kimbrough Chair
for Pediatric Dentistry in the
Washington University Department
of Surgery, Division of Plastic
Surgery for Use in the Cleft Palate/
Craniofacial Deformities Institute
for Teaching and Healing*

Surrounded by family members, Alex A. Kane, MD, is honored at a proud moment in his career as a plastic and reconstructive surgeon.

Howard and Joyce Wood Simulation Center opens

Before they encounter a real, human patient, medical students can get hands-on, state-of-the-art training at the Howard and Joyce Wood Simulation Center, officially dedicated in December 2008 at the School of Medicine's Farrell Learning and Teaching Center.

The 5,600-square-foot center, which opened for class use last October, allows groups of medical students, interns and residents to fine-tune diagnostic and treatment skills in a high-fidelity environment.

Each of the center's four suites has a life-like mannequin equipped with software and hardware that can be programmed with a range of medical conditions. Simulated events are used to provide experiences in managing high-acuity conditions. These scenarios and the associated instructor feedback provide a safe, yet realistic, learning environment for medical students to acquire essential skills required in clinical care.



"We're looking for approaches to allow the students to correlate basic science knowledge with clinical pathophysiology," explains David J. Murray, MD, the Carol B. and Jerome T. Loeb Professor and director of the Howard and Joyce Wood Simulation Center, above center, with medical students.



Celebrating the official opening of the Wood Simulation Center are: Carol B. Loeb, Betty Farrell, center benefactors Howard and Joyce Wood, and David C. Farrell.

Michael Kelp, Jan Phillips, anesthesiology resident Craig R. Cook, MD, Philip Needleman, PhD, and Sima K. Needleman learn more about the Wood Simulation Center mannequins at the dedication event.





Where you belong!

REunion²⁰⁰⁹

MAY 8-9

- ◆ **REnew** friendships
- ◆ **REthink** medicine with CME opportunities
- ◆ **REconnect** at the Family Picnic
- ◆ **REdiscover** St. Louis
- ◆ **REvisit** the ever-changing medical campus



Whether you are coming from down the street or across the country, graduated a decade ago or half a century before that ... welcome back! MD Reunion 2009 will help you to renew old ties, greet new faces and have fun along the way. Enjoy Medical Update 2009, class dinners, the Dean's Luncheon and other events.

The following School of Medicine alumni and faculty members will be honored during the awards banquet at MD Reunion 2009 for outstanding professional and personal accomplishments:

Alumni Achievement Awards

Michael K. Georgieff, MD 79
David H. Hussey, MD 64

Alumni/Faculty Awards

Will R. Ross, MD 84
Emily L. Smith, MD 68

Distinguished Service Award

William T. Shearer, MD 70, PhD

Continuing Medical Education

The following faculty and alumni speakers will present the latest in research and clinical practice at continuing medical education sessions:

Successful Cervical Cancer Prevention in Vietnam: A Cautionary Tale in Global Health

Eric Suba, MD 84

Ethics is Dead: Now What Do We Do?

Richard Thompson, MD 59

SPOTS: Sun Protection Outreach Training by Students

Lynn A. Cornelius, MD,
Associate Professor of Medicine (Dermatology)
Medical Student Panelists



Adventures in Book Writing (Medical and Otherwise)

Christopher Gallagher, MD 84

Obesity and Type 2 Diabetes in Children: A Weighty Public Health Problem

Morey Haymond, MD 69

The Challenges of Clinical Research at the NIH: Implications for the Nation

Richard G. Wyatt, MD 69

Other Events

Pre-registration is required for all events.

Family Picnic

Bring the entire family! Enjoy fresh air, face painting, games and planned activities. Lunch is included. This event is sure to be lots of fun!

Bus Tour of St. Louis

Take in the sights: Forest Park, Missouri History Museum, Laclede's Landing, the Arch, Union Station and the Anheuser Busch Breweries (and the Clydesdales). Time for lunch will be included while visiting one of these St. Louis attractions.

Kiddie Kampout

Children can participate in arts/crafts, games and other activities while their parents enjoy their class dinners. A kid-friendly dinner will be provided to each child in attendance.

For more details on MD Reunion 2009, visit: medicalalumni.wustl.edu

1930s

Benjamin (Bud) Milder, MD 39

Milder, whose primary residence is in St. Louis MO, teaches courses in light verse and music at the Lifelong Learning Institute at Washington University. During the winter months, he teaches at Florida Atlantic University.

1940s

Terrell Covington Jr., MD 43

Covington and his wife, Nancy, are both retired and reside in Tulsa OK. They enjoy spending time with their five youngest grandchildren. This past fall, their twin granddaughters began their academic careers at Washington University (Anna and Emily Moseley). Covington looks forward to visiting the campus later this year.

David Feldman, MD 43

Feldman is retired and living at home in St. Louis. He enjoys going to the health club daily, cooking, and spending time with his friends. He attends medical rounds regularly. He also enjoys visiting his children in California every year.

Edgar N. Lockett, MD 45

Lockett is retired and for the past several years has been living in Tampa FL, which he finds to be a beautiful city. His children live nearby, and he is able to go fishing with his son once a week in Tampa Bay.

George W. Prothro, MD 45

Although Prothro is retired, he continues to stay busy as a volunteer in his community drug recycling program. His efforts help to make 1 million prescription drugs available for free to qualified low-income persons. The drugs are sealed, non-narcotic, unused prescription drugs from nursing homes. He resides in Tulsa OK.

Eugene E. Taylor, MD 45

Taylor is retired, but still enjoys working one day each week as a volunteer doing psychiatric disability evaluations. His wife, Bonnie, died three years ago, but he feels fortunate that his children live close by. He lives in a retirement community in Milwaukie OR.

1950s

Marvin E. Levin, MD 51

Levin and **Lawrence W. O'Neal, MD 46**, announce the publication of the 7th edition of *Levin and O'Neal's The Diabetic Foot*, published by Mosby Elsevier. Fully updated, this latest edition continues the tradition of providing complete diagnostic and management information for the specialists faced with the challenging problem of caring for patients with diabetic foot problems. This text is world renown and is credited with helping to prevent amputations due to diabetes.

Joseph L. Martin, MD 54

Martin is retired and recently turned 80 years old. He has four children and 14 grandchildren, at least one of whom is headed to medical school. He lives in Oklahoma City OK, and enjoys fishing for striped bass at Lake Tacoma.

Donald E. Meredith, MD 54

Meredith is retired and splits his time between his homes in Mankato MN and Arizona. From November through April, he volunteers one day each week at the Gila Indian Hospital as an orthopedic surgeon in the outpatient department. He enjoys this *pro bono* work very much. In the fall, he spends time hunting upland game in North Dakota.

Ward E. Dickey Jr., MD 59

Dickey, of Boise ID, retired from medical practice in 1999 and now works part-time reviewing social security disability cases.

Charles Kilo, MD 59

Kilo chairs the Kilo Diabetes and Vascular Disease Research Foundation established in 1972. He was the recipient of a 2nd Century Award from Washington University in 1998 and of a St. Louis Academy of Science Award in 2008. He lives in St. Louis MO.

Louis J. Reed, MD 59

After retiring from private practice two years ago, Reed decided to take a full-time job teaching hematology/oncology at Jacobi Medical Center in the Bronx NY. He has been appointed to the position of clinical associate professor of medicine at Albert Einstein College of Medicine in New York City.

1960s

Don E. Cheatum, MD 64

Cheatum practices rheumatology in Dallas TX. He has recently endowed a scholarship at Washington University. His son, "Woody," is an undergraduate senior on the Danforth Campus.

William Friedman, MD 64

Friedman is retired and lives in St. Louis MO. He spends his summers in Boothbay Harbor ME. He enjoys fly-fishing, boating and playing golf.

Robert L. Palmer, MD 64

Palmer is fully retired. He spent his final 19 years of practice working in the emergency room at St. Mary's Medical Center in Walla Walla WA. His first wife, Linda, died of cancer in 1987; however, three years ago he was remarried. His wife, Mary, is an RN and they recently built a retirement home in southern Idaho. Palmer's current activities are drawing portraits and animals, working outside and travel.

Richard S. Myers, MD 65

Myers recently finished his term on the Board of Trustees at Rex Hospital in Raleigh NC. He served 14 years, the last six as chairman. To honor his service, a continuing medical education scholarship was established in his name at the hospital. In addition, he was recently awarded the "Order of the Long Leaf Pine," the highest civilian honor that can be presented by the governor of North Carolina.

James G. Creveling Jr., MD 68

After practicing neurology for 30 years, Creveling retired in 2002. He then moved to the northern part of Florida to be near his children and grandchildren. Creveling resides in Boynton Beach FL and enjoys renovating his older home and spending time with friends.

Michael P. Pacin, MD 69

Pacin's private practice, Center for Allergy & Asthma Care, just opened its 15th office and will soon open No. 16. It is located in Miami-Dade, Broward and Palm Beach counties in South Florida. His wife teaches law at St. Thomas University School of Law in Miami and the couple enjoys traveling to Peru, Tanzania and Bolivia.

1970s

Scott C. Fleischman, MD 74

Fleischman, a resident of Phoenix AZ, will soon be working only part-time and will no longer be taking calls. He looks forward to traveling, playing golf, reading and spending time with family and friends.

David P. Dooley, MD 79

Dooley, who retired from the U.S. Army after serving for 30 years, is now chief of education at the VA Hospital in San Antonio TX. He and his wife, Michelle, live in New Braunfels TX. They enjoy spending time with their grandson.

Sandy L. Fogel, MD 79

Fogel and his wife, Alice D. Ackerman, MD, moved to Roanoke VA this past year and took positions with Carilion Clinic, which is preparing to open a new medical school in affiliation with Virginia Tech. Fogel has three daughters: One starts medical school next year; one is a math major at Tufts University; the third is a biochemical major at Case Western Reserve University.

1980s

Mary O. Polk, MD 84

Polk is a pulmonologist at SSM DePaul Health Center in St. Louis MO. Her specialty is in pulmonary and sleep medicine. Her two children, Jordan, 15, and Madison, 14, attend Mary Institute and Saint Louis Country Day School in St. Louis.

1990s

Tom Carmichael, MD 90

Carmichael works in academic neurology at the University of California, Los Angeles (UCLA). His focus is on stroke and neuro-rehabilitation. He conducts basic science research in neural repair after a stroke. He resides in Los Angeles CA.

Marianne Ingels Bacharach, MD 94

Bacharach works part-time in the emergency department at Oklahoma City's VA Medical Center. She and her husband, Phil, have two children: Audrey, 3, and Max, 1. They reside in Oklahoma City OK.

MAXIMIZE Your Reunion Giving

Eliot Society Challenge supports medical student scholarships



Calling all MD Reunion 2009 classes! Now you can make an even bigger difference through this exclusive offer. Robert Connor, MD 79, is sponsoring a \$130,000 challenge in honor of his 35th reunion.

This challenge grant matches special reunion-year Eliot Society Gifts:

- **First-time** Eliot Society memberships
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Your gift can be directed to any of the School's annual fund options.

For more information, contact Medical Alumni & Development at (314) 935-9680 or scottdrost@wustl.edu

Kim (Allman) Jones, MD 94

Jones, a resident of Los Altos CA, practices general pediatrics at the Palo Alto Medical Foundation. She has two children: Jessica, 6, and Nate, 2.

Corina Norrbom, MD 94

After spending nearly 12 years in rural family medicine, Norrbom is planning to take a sabbatical in order to explore other medical systems. She hopes to spend time in New Zealand, which would enable her to live and work in a country with a nationalized health system. Eventually, she wishes to become an advocate for meaningful change to the U.S. health care system.

Laura Gladstone, MD 99

Gladstone is in her third year of colorectal surgery private practice. She has been married for one year. Gladstone and her husband reside in Seattle WA.

2000s

Celeste Chu Kuo, MD 04

Kuo works part-time in private pediatrics at Healthcare for Kids, a clinic for Medicaid patients in St. Louis MO. She and her husband, Elbert, a cardiothoracic surgery fellow at Barnes-Jewish Hospital, have a son, 2.

Omoniyi Omotoso, MD 04

Omotoso completed his first year of pediatric infectious diseases fellowship and now is taking an accelerated one-year master's program in public health for epidemiology at the University of California, Berkeley. He hopes to return to Children's Hospital and Research Center in Oakland for the research portion of his fellowship.

Karen Zink, MD 04

Zink is in her last two years of surgery residency. She was married this past year to John Teeter, who is a quality engineer for Nike. They reside in Portland OR.

IN MEMORY

Charles Silverberg, MD 38

Silverberg died on Nov. 22, 2008. He was 94. He was a cardiologist who practiced at Jewish, St. Anthony's, St. Mary's and Saint Louis University hospitals in St. Louis MO.

James McLaren Lansche, MD 42

Lansche passed away on Nov. 2, 2008. He was 78. After graduating from the School of Medicine at age 21, he completed an internship in internal medicine at Yale University, a research fellowship at Barnes Hospital, and a residency in neurosurgery at the University of California, San Francisco, where he met his wife, Joan Mell. A flight surgeon in the U.S. Air Force from 1953-55, he served tours of duty in Korea, Japan and India. He retired in 1992, and continued to enjoy an Idaho lifestyle, spending much of the year at his beloved cabin on the Henry's Fork. He had a passion for learning, and his hobbies included astronomy, geology, history, woodworking, art and painting outdoor landscapes.

Joseph C. Williams Jr., MD 42

Williams died on Nov. 19, 2008. He completed his undergraduate work and medical school at Washington University, then interned at St. Louis Maternity and Barnes Hospital. During his second year of medical school he married Jeanne Dodds. After spending two years in Stuttgart, Germany, as a captain in the U.S. Army, he completed his residency and started practicing in Kansas City at Research Medical Center, where he later became president of the medical staff. A highlight of his career was delivering the Giambone quadruplets.

Leonard Kent, MD 43

Kent died on Jan. 1, 2009. He graduated with honors from the School of Medicine. After World War II broke out, he enlisted in the army medical core. He met his wife of 57 years, Irene (deceased), during the postwar occupation of Czechoslovakia. The couple settled in Los Angeles CA, where he specialized in internal medicine. He taught clinical medicine at UCLA, where he was a part-time assistant professor. His interest in science and nature led him into the world of collecting bromeliads, flowering plants of the pineapple family.

Everett R. (Hap) Lerwick, MD 48

Lerwick died on Dec. 10, 2008. After graduating from the School of Medicine, he completed residencies in plastic and general surgery and proudly served his country as ship's surgeon aboard the USS Juneau during the Korean conflict. He established a private medical practice at Missouri Baptist Medical Center in St. Louis MO, and served as chief of surgery for 35 years before retiring in 1995. His medical and business accomplishments were numerous and varied, including the invention of the "Leritome," a medical instrument for removing plaque from arteries, opening a chain of meat markets to sell low-cholesterol beef, and establishing the Lerwick Clinic in downtown St. Louis. He lectured nationally and internationally at medical conferences on vascular and colorectal procedures he had pioneered.

Walter S. Strode, MD 48

Strode died on Nov. 12, 2008. He was 83. After 49 years of service as a urologist at Straub Clinic & Hospital in Honolulu HI, he retired in 2004. His father, **Joseph E. Strode, MD 15**, was one of the group's founders. The younger Strode served as chair of Straub's urology department and director of the Kidney Stone Center of the Pacific. He was a founder of the Hawaii Health Net in the 1970s. After graduating from the School of Medicine, he completed urology training at Tulane University's Ochsner Medical Clinic in Louisiana and a residency at Queen's Medical Center in Honolulu. He was a corpsman in the U.S. Navy at the end of World War II and served in the U.S. Army during the Korean War. *Honolulu Magazine* listed him among the "Best Doctors in America." He was an avid tennis player and enjoyed playing bridge with his wife, Molly. She survives, as do four daughters, two sons, two stepchildren and a sister.

Phillip Comens, MD 51

Comens died on Jan. 9, 2009, at his home in Sunset Hills MO. He was 85. Passionate about his medical practice and the care of his patients, he practiced until the age of 84, when he was forced to retire due to ill health. He served two years as a medic in the U.S. Army during World War II, and

then attended the University of Missouri in Columbia. Before establishing his private practice at Barnes Hospital and Deaconess Hospital in St. Louis, he carried out extensive research in hypertension and cardiology at the School of Medicine, where he was an associate professor of medicine. A licensed pilot, he joined the Missouri National Guard and became a flight surgeon. Known as the Guard's oldest recruit, he carried out research on the physiological responses of pilots in flight and combat. He and his wife were avid travelers and visited most of the world together.

Keith L. Parker, MD 81, PhD 81

Parker died on Dec. 13, 2008, at age 54. Internationally known for his work on the development and regulation of the adrenal glands and gonads, he was a professor of internal medicine and of pharmacology at the University of Texas Southwestern Medical Center in Dallas, as well as chief of the Division of Endocrinology and Metabolism. After earning his medical degree, graduating *cum laude*, and a doctorate in immunogenetics at Washington University, he completed a residency in internal medicine and a research fellowship at Harvard Medical School. He previously held an academic appointment at Duke University Medical School where he was supported by the Howard Hughes Medical Institute. He was an associate editor of *Goodman and Gilman's The Pharmacological Basis of Therapeutics*, and he published about 100 peer-reviewed research papers and 37 invited reviews. He also received numerous academic, research and teaching awards, including the Endocrine Society's Ernst Oppenheimer award in 1996 and the British Endocrine Society's Transatlantic Medal in 2004. Parker is survived by his wife, Linda; two sons, Kevin and Christopher; three daughters, Andrea, Emily and Caroline; his parents, **Charles W. Parker, MD 53**, professor emeritus of medicine, and **Mary Langston Parker, MD 53**, associate professor emerita of preventive medicine and of clinical medicine; a brother, **Charles S. Parker, MD 82**; three sisters, **Christina M. Parker, MD 83**, **Katherine Parker Ponder, MD 83**, and **Sandra Mary Parker Bigg, LA 82**.

Brian J. Hartigan, MD 94

Hartigan died on Sept. 23, 2008, at Northwestern Memorial Hospital in Chicago. He was an orthopedic surgeon with Northwestern Orthopedic Institute, specializing in the diagnosis and treatment of trauma to and conditions of the upper extremity, including the hand and wrist. He obtained his undergraduate degree in chemistry at the University of Illinois in 1990. After graduating from the School of Medicine, he completed an internship and residency at Northwestern University School of Medicine, as well as a hand surgery fellowship. He was chief resident at Northwestern and a popular instructor with students and residents.

FACULTY

Abdullah M. Nassief, MD

Nassief died suddenly on Feb. 3, 2009, while playing soccer, one of his favorite pastimes. He was 43. One of the region's premier experts on stroke, he was an associate professor of neurology, co-director of the Cerebrovascular Disease Section in the Department of Neurology, and director of the Neurology Residency Program at the School of Medicine and of the Clinical Stroke Center and of Acute Rehabilitation Services at Barnes-Jewish Hospital. He spearheaded the team that led to Barnes-Jewish Hospital's naming as a Primary Stroke Center by the Joint Commission, the first subspecialty accreditation in any area of medicine obtained by the hospital. He played a central role in developing Washington University Medical Center as one of the premier stroke centers in the country. Nassief earned a medical degree at King Saud University College of Medicine in Riyadh, Saudi Arabia, in 1989. He completed residencies at King Fahad Hospital in Riyadh and at the University of Vermont. He then underwent two years of fellowship training in cerebrovascular disease at Washington University School of Medicine before joining the faculty in 2000. He was an admired and recognized teacher who won several teaching awards. He is survived by his wife, Sheri, and two sons, Fahriss, 8, and Sammy, 5.



Washington University benefactor Edith L. Wolff with former School of Medicine Dean William A. Peck, MD, Kenneth S. Polonsky, MD, and WUSTL Chancellor Mark S. Wrighton, PhD.

Edith L. Wolff: Patroness of research, teaching

Edith L. Wolff, a longtime donor to the School of Medicine, died on Dec. 26, 2008, at Barnes-Jewish Hospital after a brief illness. She was 93.

Wolff and her late husband, Alan A. Wolff, directed funds to multiple areas of medical research at the School of Medicine for more than 30 years. Most recently, Mrs. Wolff committed \$20 million in late 2007 to establish the Alan A. and Edith L. Wolff Institute, which supports biomedical research projects that lead to the prevention, treatment and cure of disease.

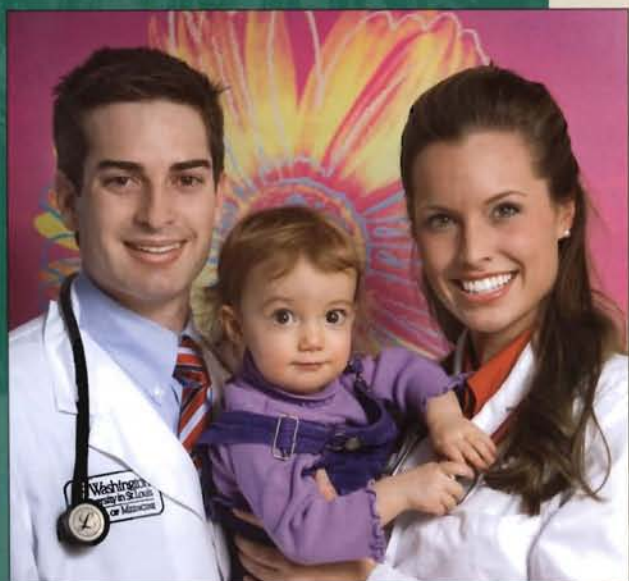
In addition, Mrs. Wolff endowed two professorships. The Alan A. and Edith L. Wolff Professorship in Medicine was established in 1999 to support progress in understanding cancer and is held by Timothy J. Ley, MD. In 2003, she endowed the Alan A. and Edith L. Wolff Distinguished Professorship in Medicine, held by William A. Peck, MD, former executive vice chancellor and dean of the School of Medicine and now director of the Center for Health Policy. She also established the Edith L. Wolff Scholarship-Loan Fund, a non-interest-bearing fund for medical students.

Alan Wolff founded Wolff Construction Co., a real estate development, investment and management company, in the late 1940s. During the '50s and '60s, the company built shopping centers in Missouri, Illinois and Kansas. Following Mr. Wolff's death in 1989, Mrs. Wolff became president of the company, which flourished under her direction and now focuses on real estate investment and on management and leasing of commercial buildings.

She also began a more active and public philanthropic career and sought to set an example of public giving in the hope that others might increase their charitable giving within their means. She gave to numerous causes and charities, with the largest contributions being made to Washington University, Barnes-Jewish Hospital Foundation, St. Louis ARC and its Childgarden School, Life Skills Foundation, Miriam Foundation and Rainbow Village Foundation. Mrs. Wolff's charitable contributions have been previously recognized by numerous awards from the organizations she benefited, including an honorary doctorate from the university in recognition of her extraordinary support of lifesaving medical research.

Scholars in Medicine

SCHOLARSHIP PROGRAM



- Scholarship support is one of the highest priorities of the School of Medicine. As the costs of medical education continue to increase, it is our goal to provide financial support that reduces debt upon graduation and allows students to make career choices based more on passion and less on income.

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Sustaining Endowed Scholarship	\$100,000
Endowed Scholarship	\$50,000



Annual Scholarship sponsors Jack Pierce, MD, emeritus professor of medicine, and his wife, Susan, meet scholarship awardee Ian Dorward, MD, who graduated with the Class of 2005 and is now a neurosurgery resident at WUSM.

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Origins of wonder "I am awestruck by this world we so fleetingly inhabit," says artist Janice Schoultz Mudd, who recently exhibited her work at the Farrell Learning and Teaching Center. Mudd reflects upon the enduring human quest to explain our origins through spiritual experiences and scientific explorations. Her "Earth Code Genesis" series of paintings imagine a divine sketchbook, the works of an ultimate scientist, artist, philosopher and mathematician designing the entirety of this Earth and universe. The visuals she presents span the familiar to the unintelligible. "This is intentional," says Mudd, "for we have discovered only a small fraction of what there is to know."



Teacup with images of the new
North and South buildings, ca. 1915

Courtesy Bernard Becker Medical Library/ Archives and Rare Books

Back to the beginning

A century ago, the Carnegie Foundation for the Advancement of Teaching issued a scathing report on Washington University's then-meager medical college. Administrators responded with plans for the modern School of Medicine. The North and South buildings, depicted inside a period teacup, were the first constructed as part of that vision. For more on this story, please see page 21.



Washington University in St. Louis
SCHOOL OF MEDICINE

ERIC YOUNG